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SEP 82 N S PACHECO, D G KNIOLA, J F SHEEDY

USAFA-TR-82-6-APP-C

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USAFA TR-82-6

**SIMPLIFIED SOLAR FRACTION ESTIMATION FOR SPACE  
AND WATER HEATING AT DOD INSTALLATIONS  
APPENDIX C - WATER HEATING NOMOGRAPHS**

AD A120014

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**SEPTEMBER 1982  
FINAL REPORT**

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This research report is presented as a competent treatment of the subject, worthy of publication. The United States Air Force Academy vouches for the quality of the research, without necessarily endorsing the opinions and conclusions of the author.

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This research report has been reviewed and is approved for publication.

  
THOMAS E. MCCANN, Lt Colonel, USAF  
Director of Research and  
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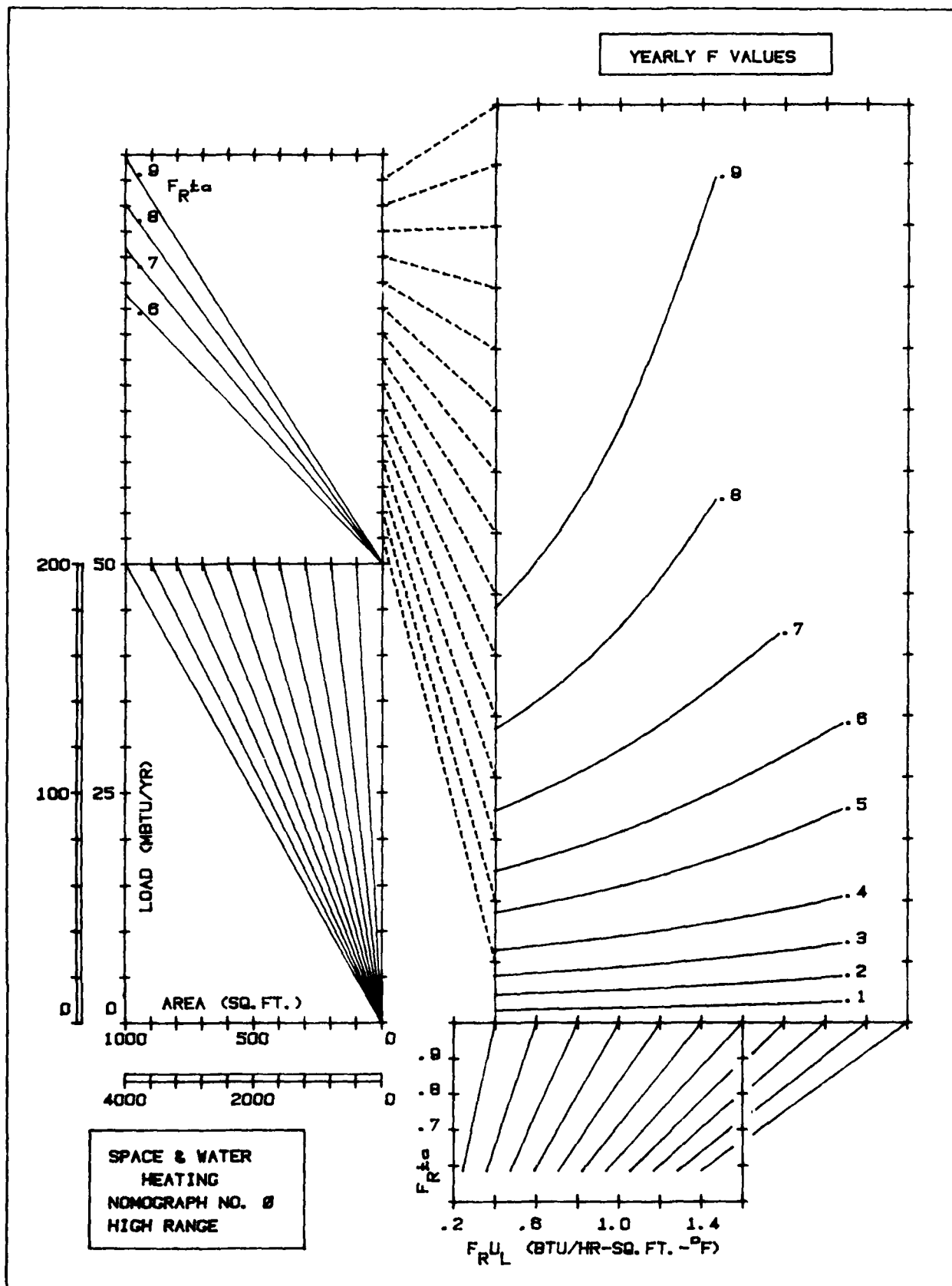
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report contains a set of nomographs which can be used to estimate the average annual solar fraction for solar space and water heating at a large number of DOD facilities. The solar fraction estimated from the nomograph is in close agreement with F-Chart 3.0 and allows for variation of the following parameters: annual load, collector area, collector transmittance-absorptance coefficient, and collector overall loss coefficient.		

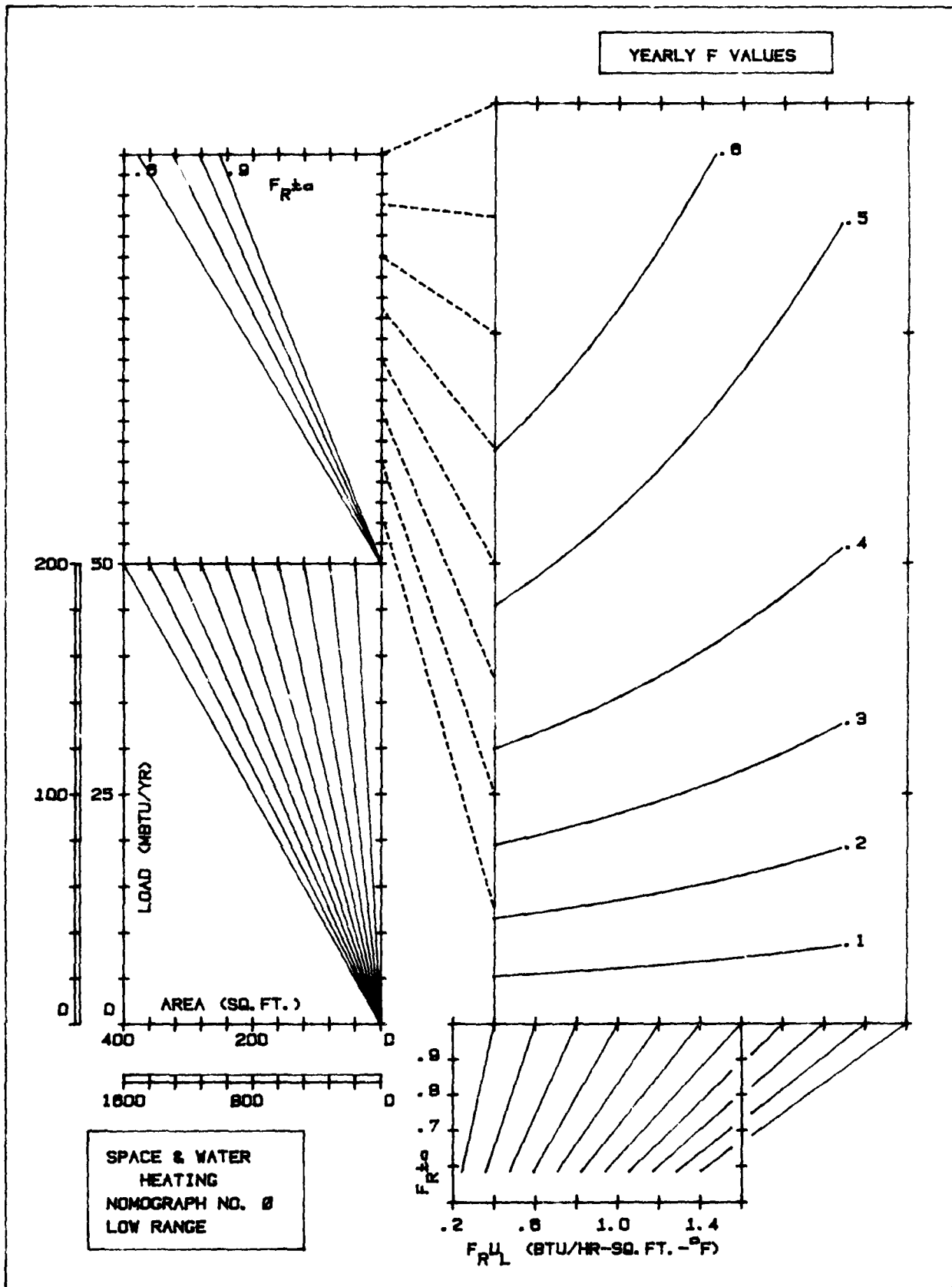
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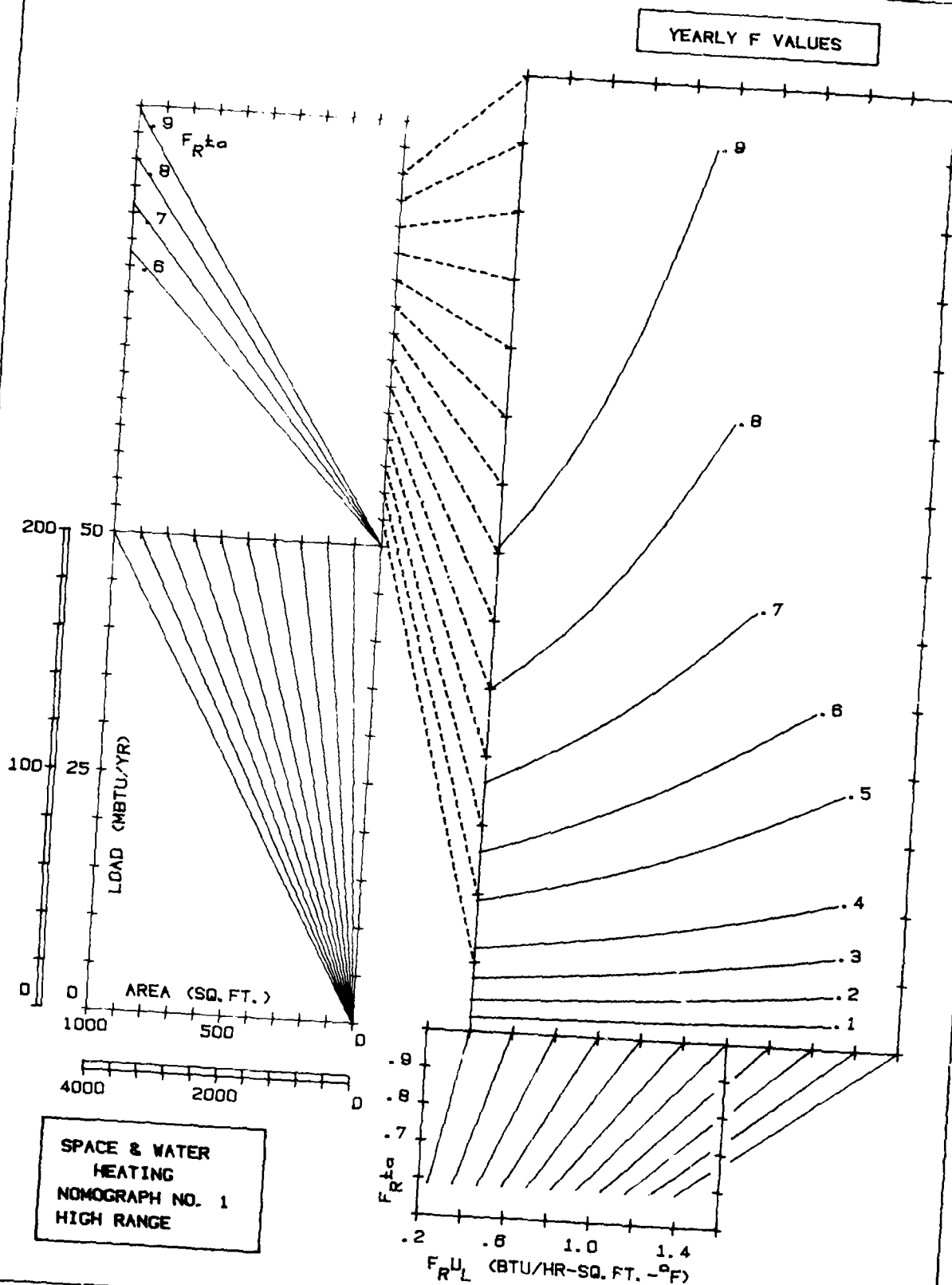
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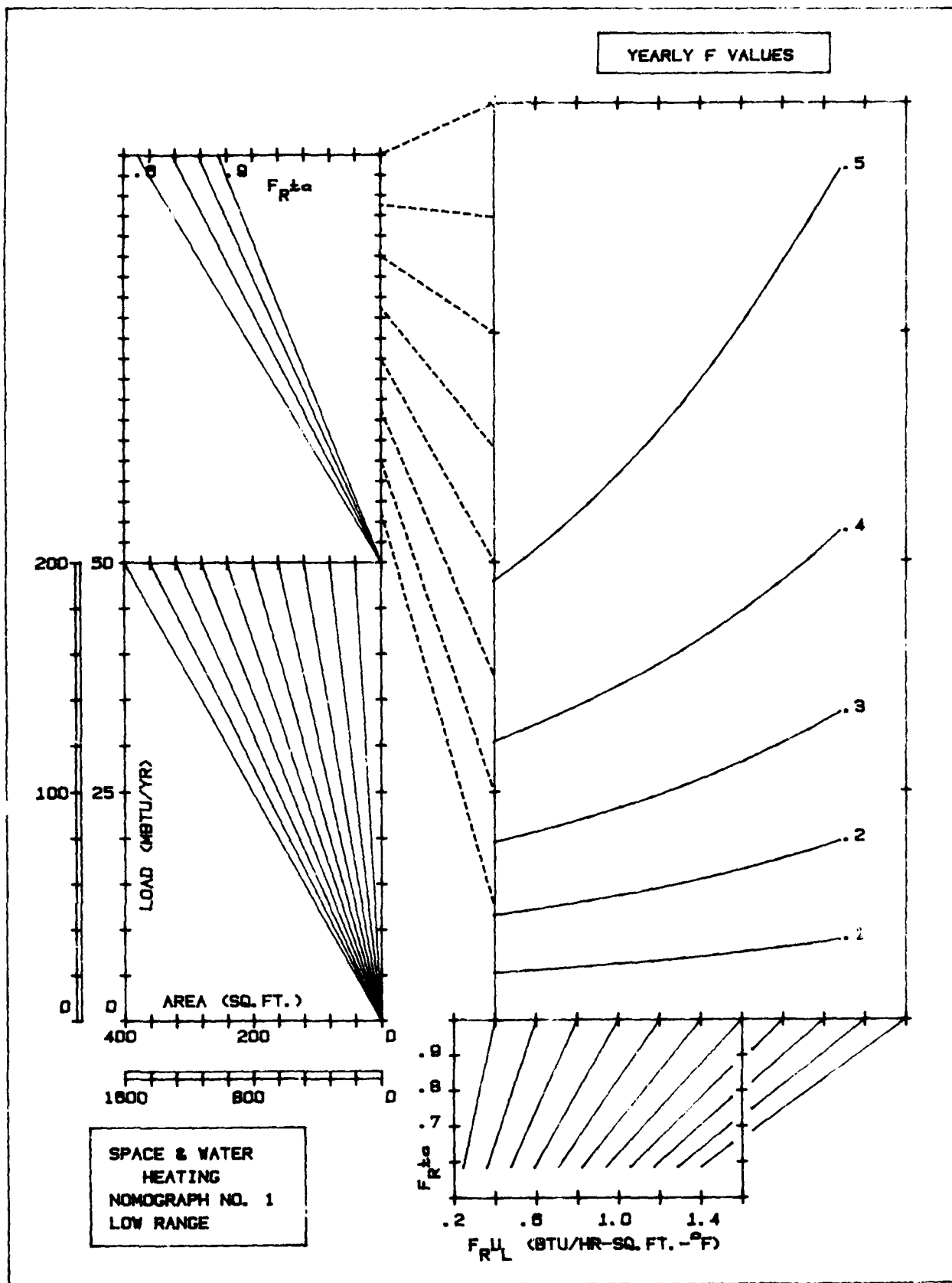
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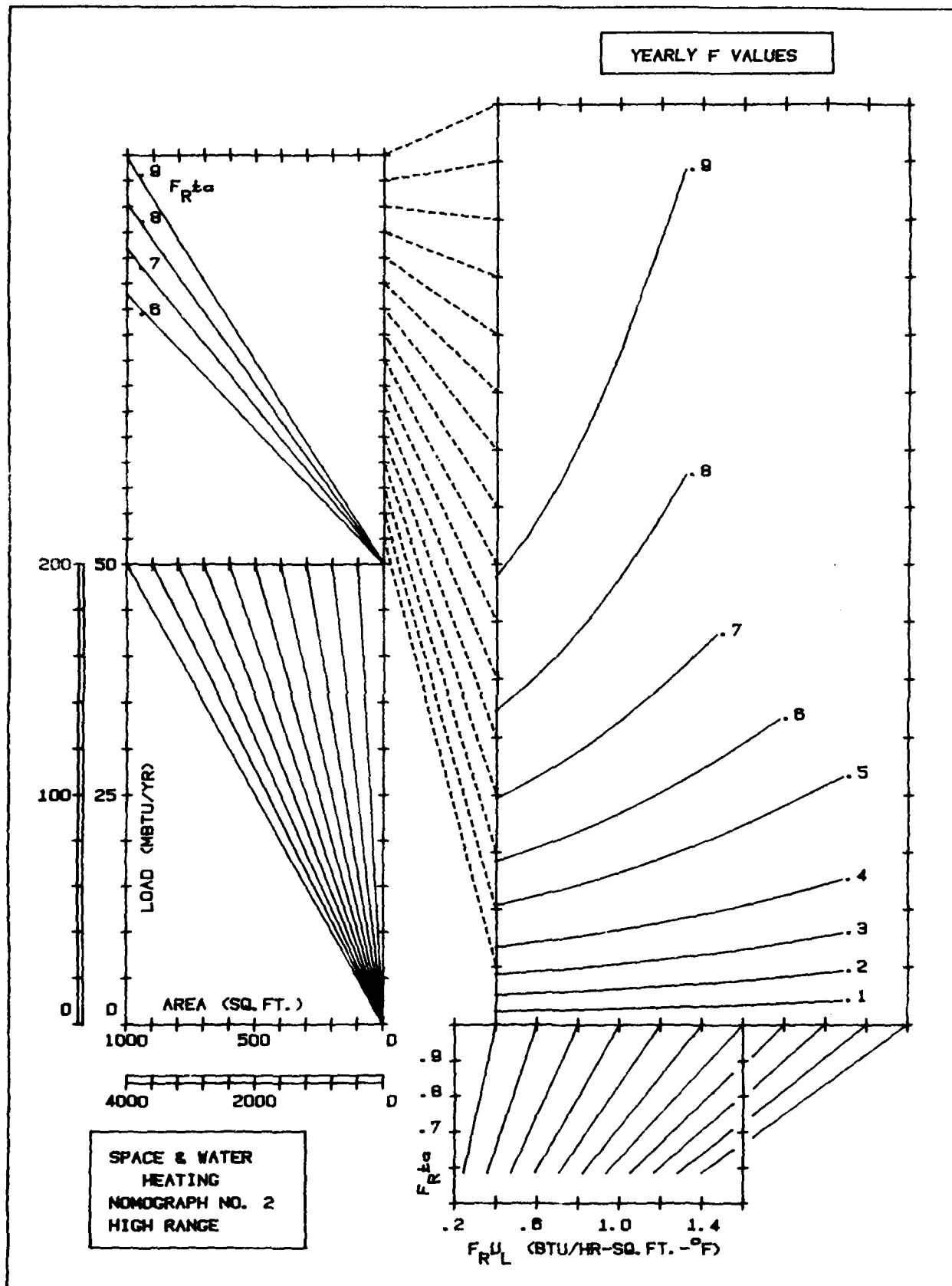


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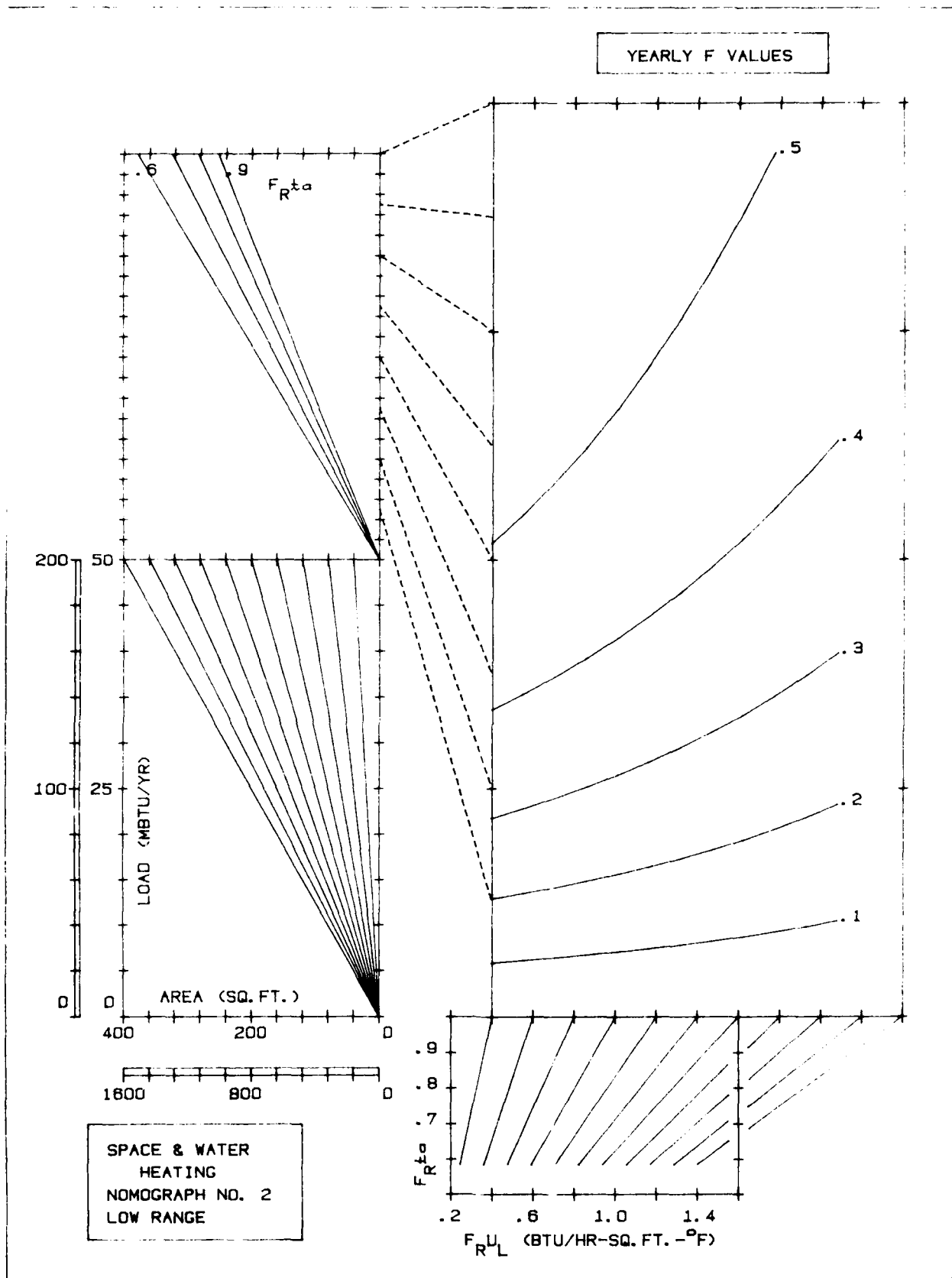


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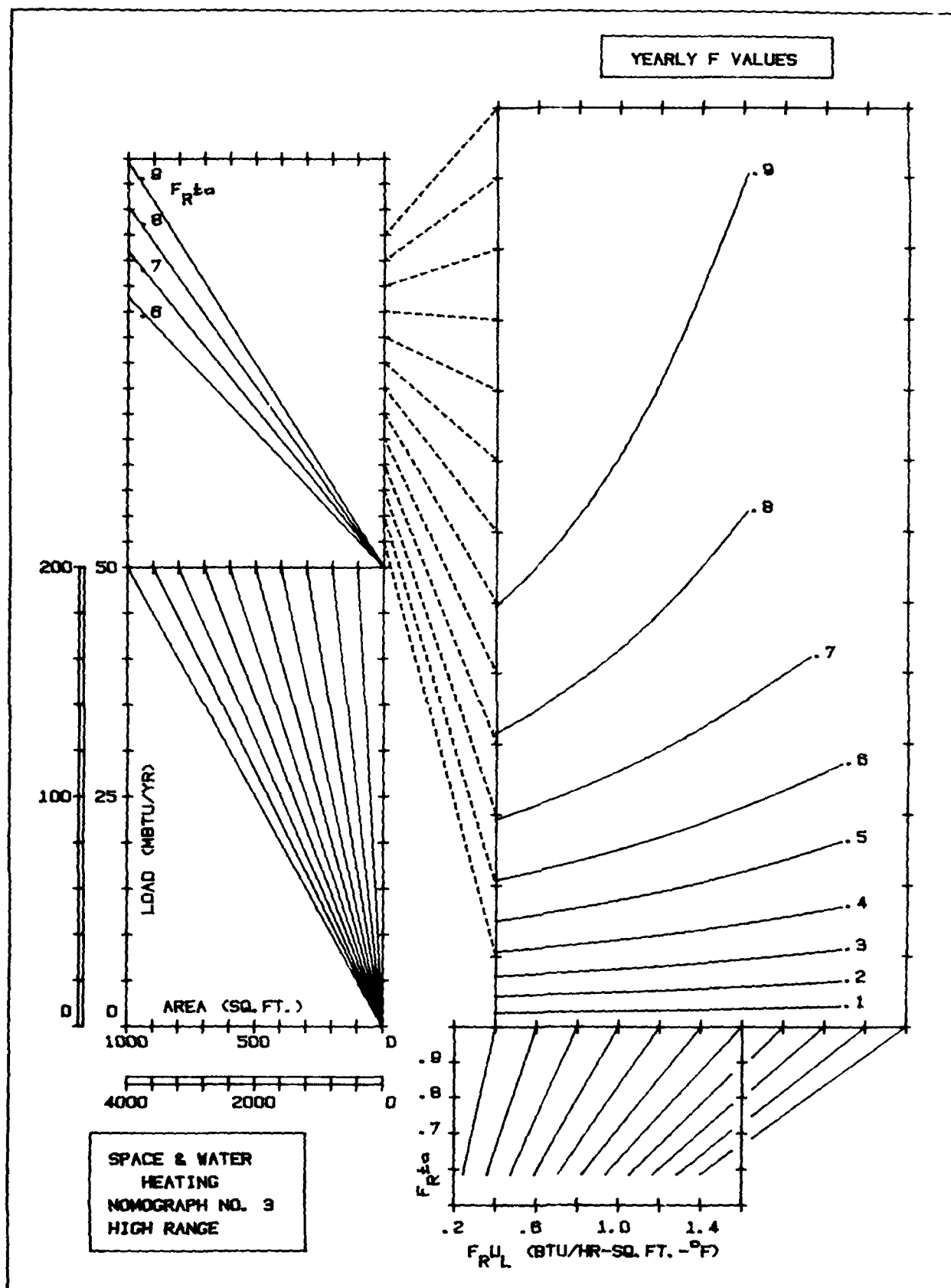




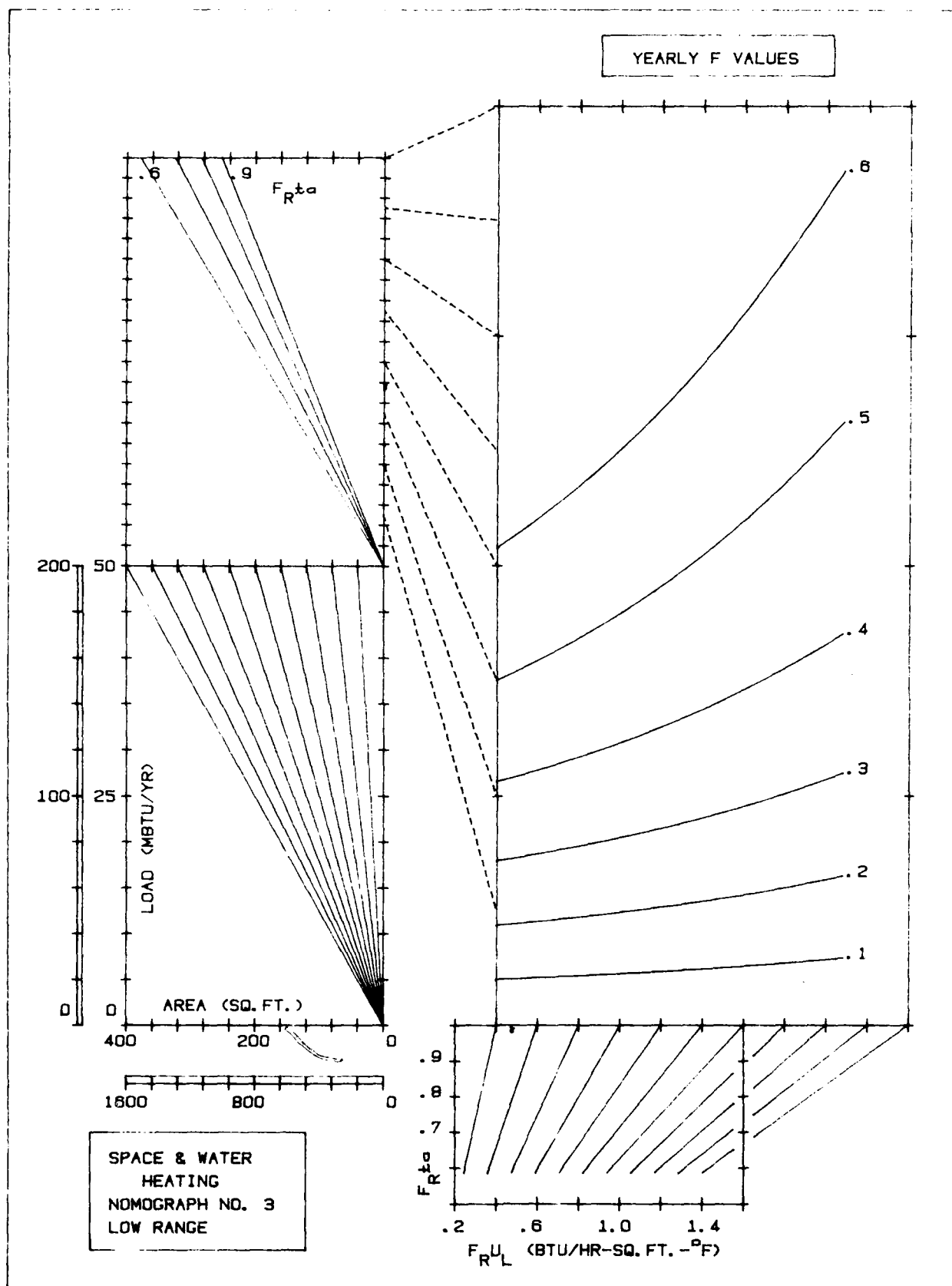
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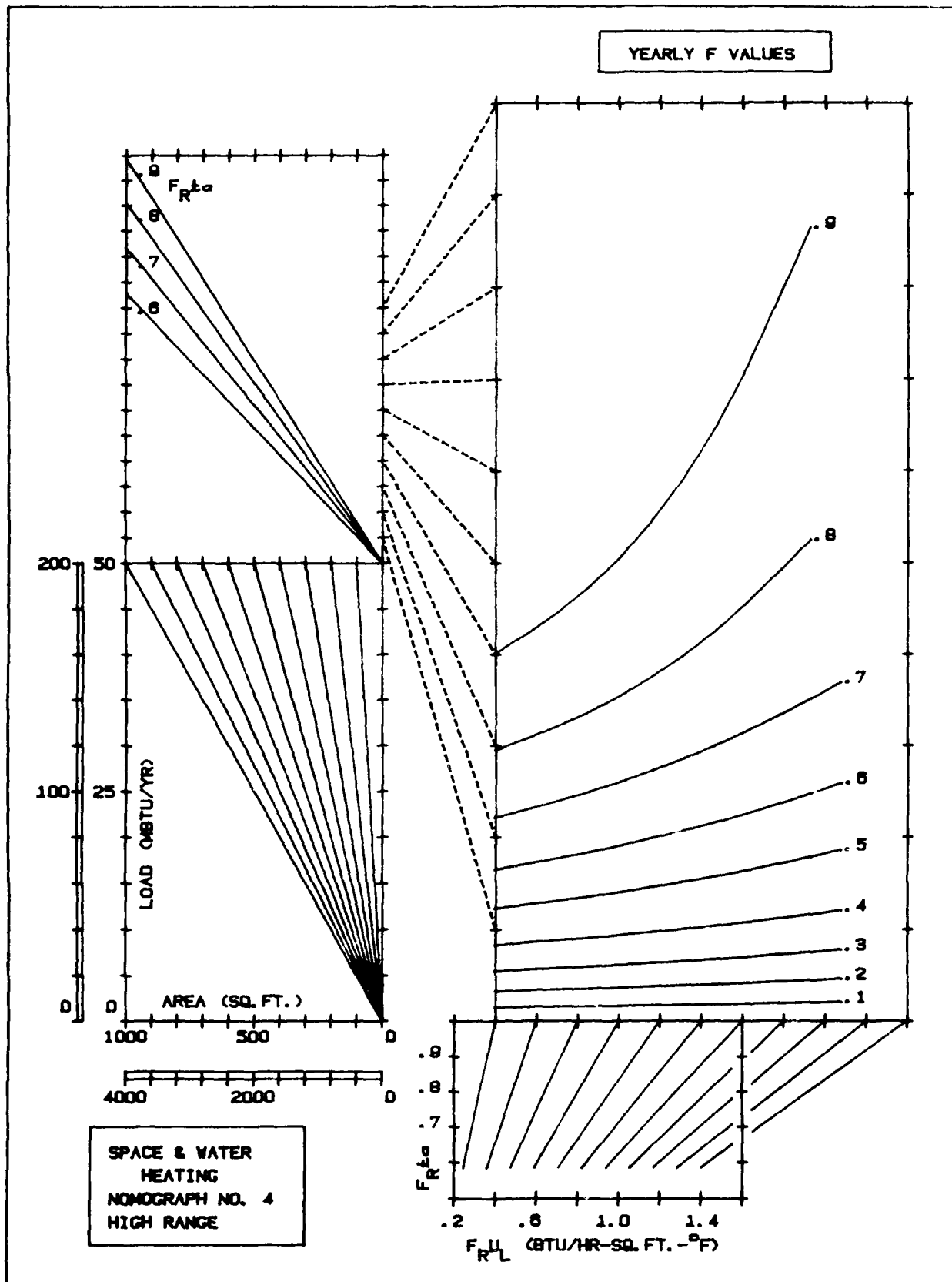
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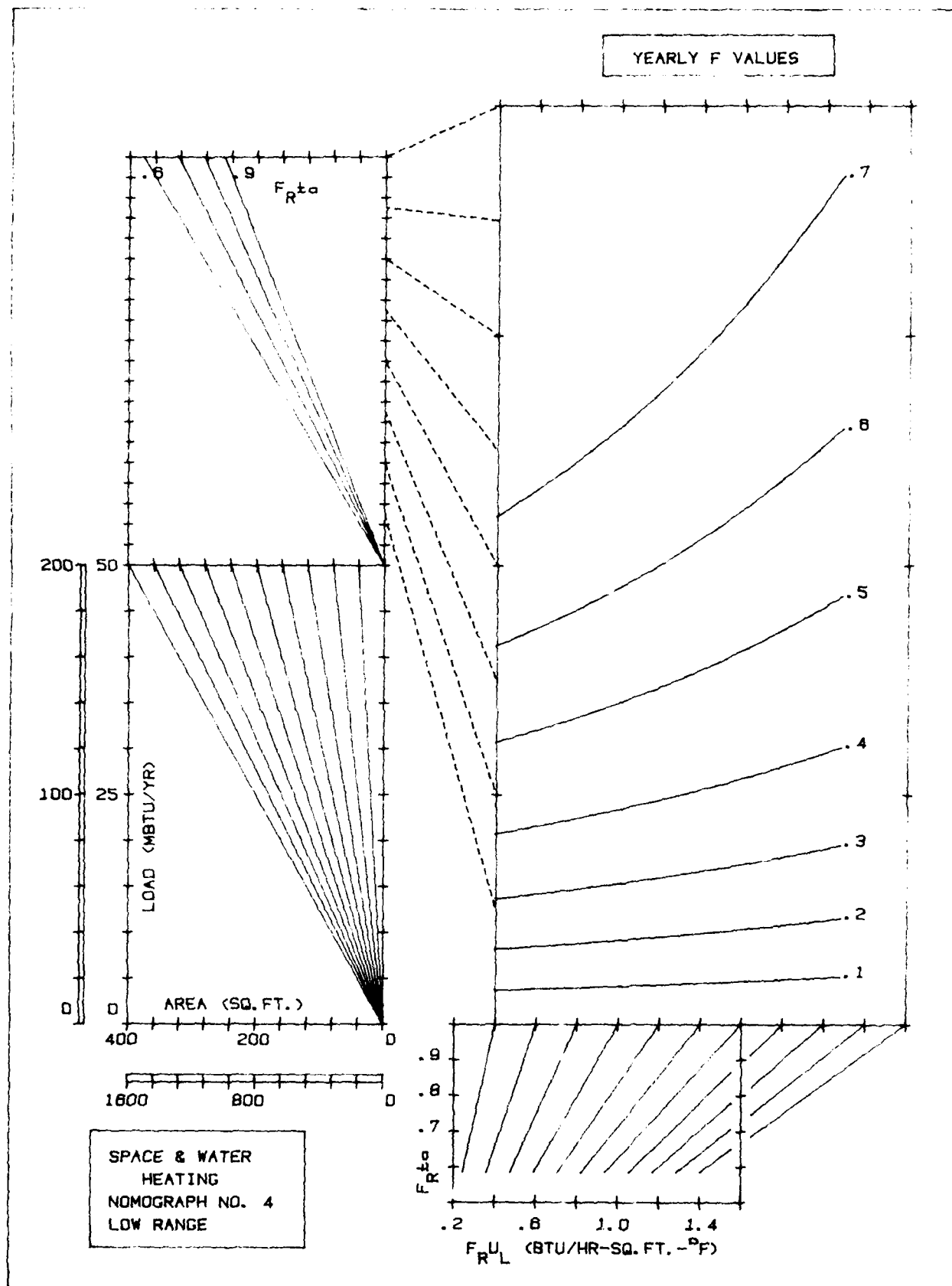
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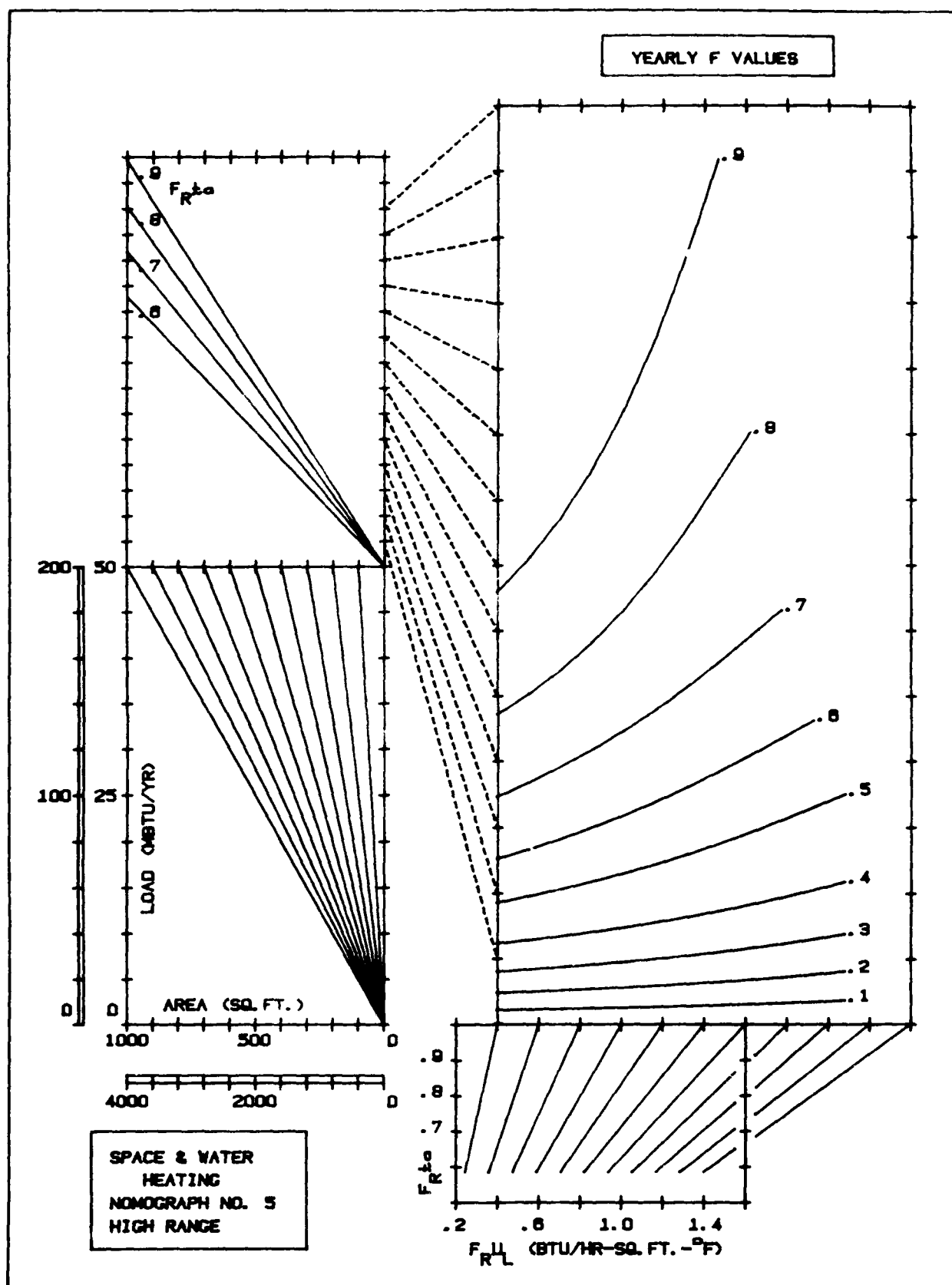
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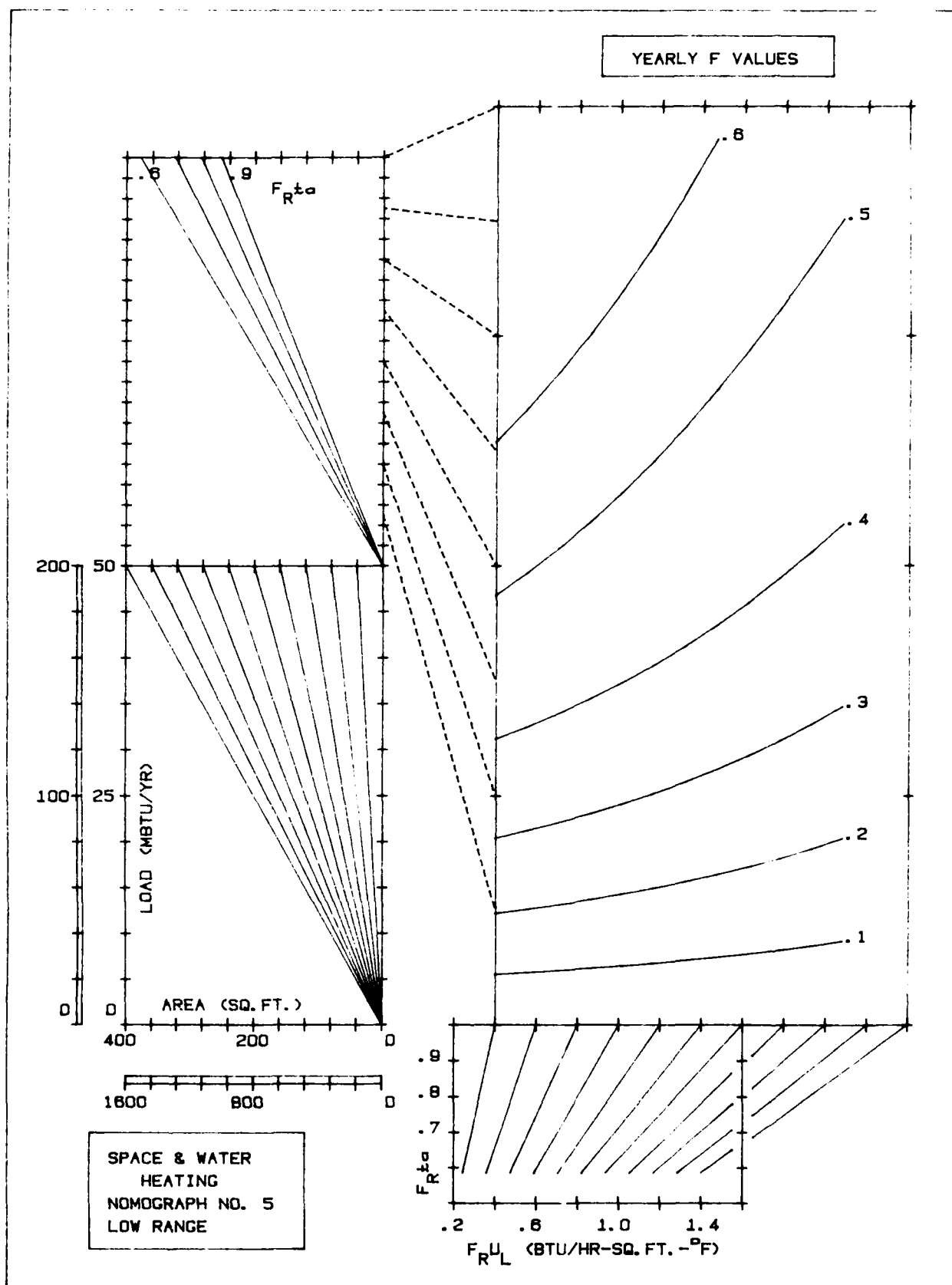
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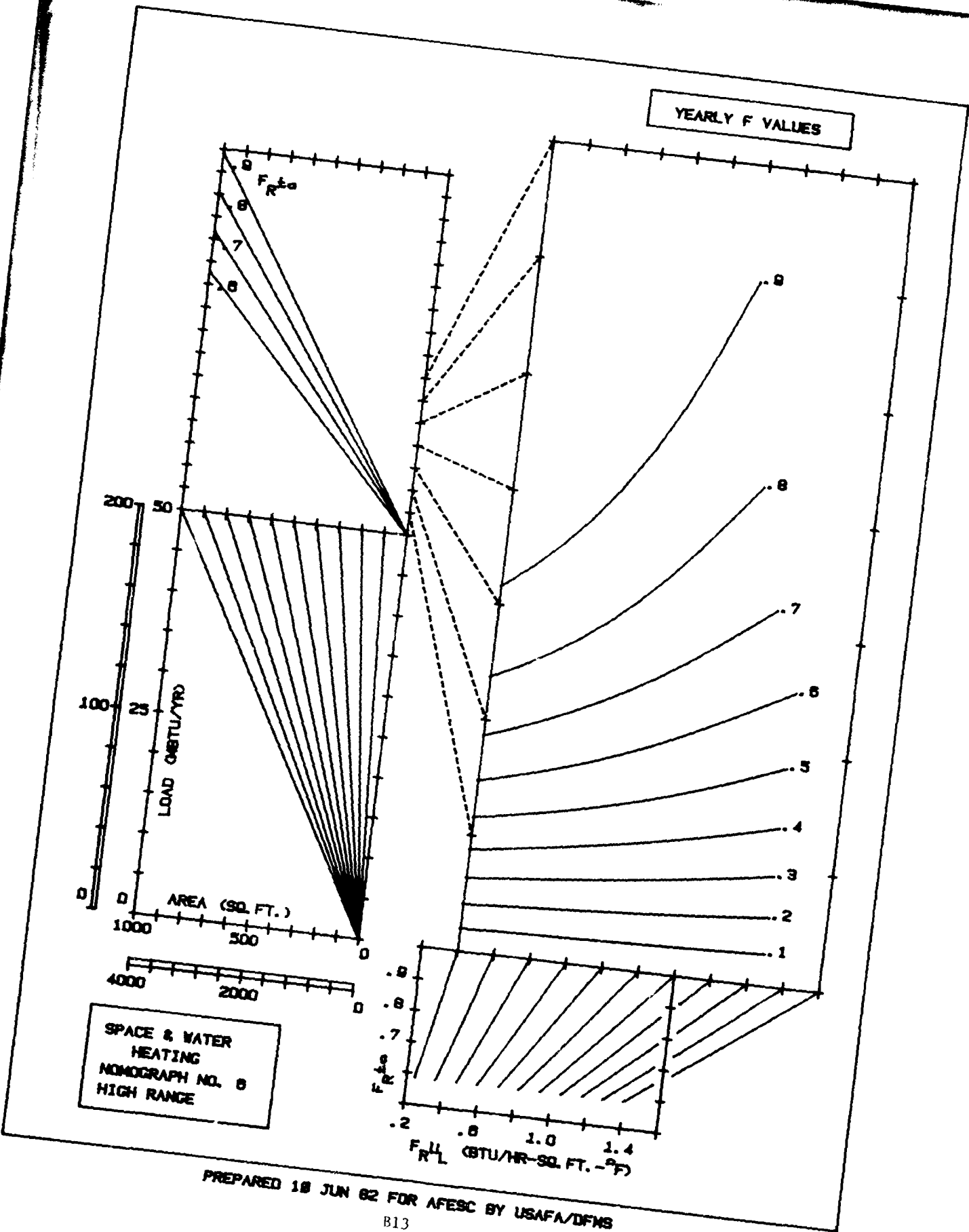


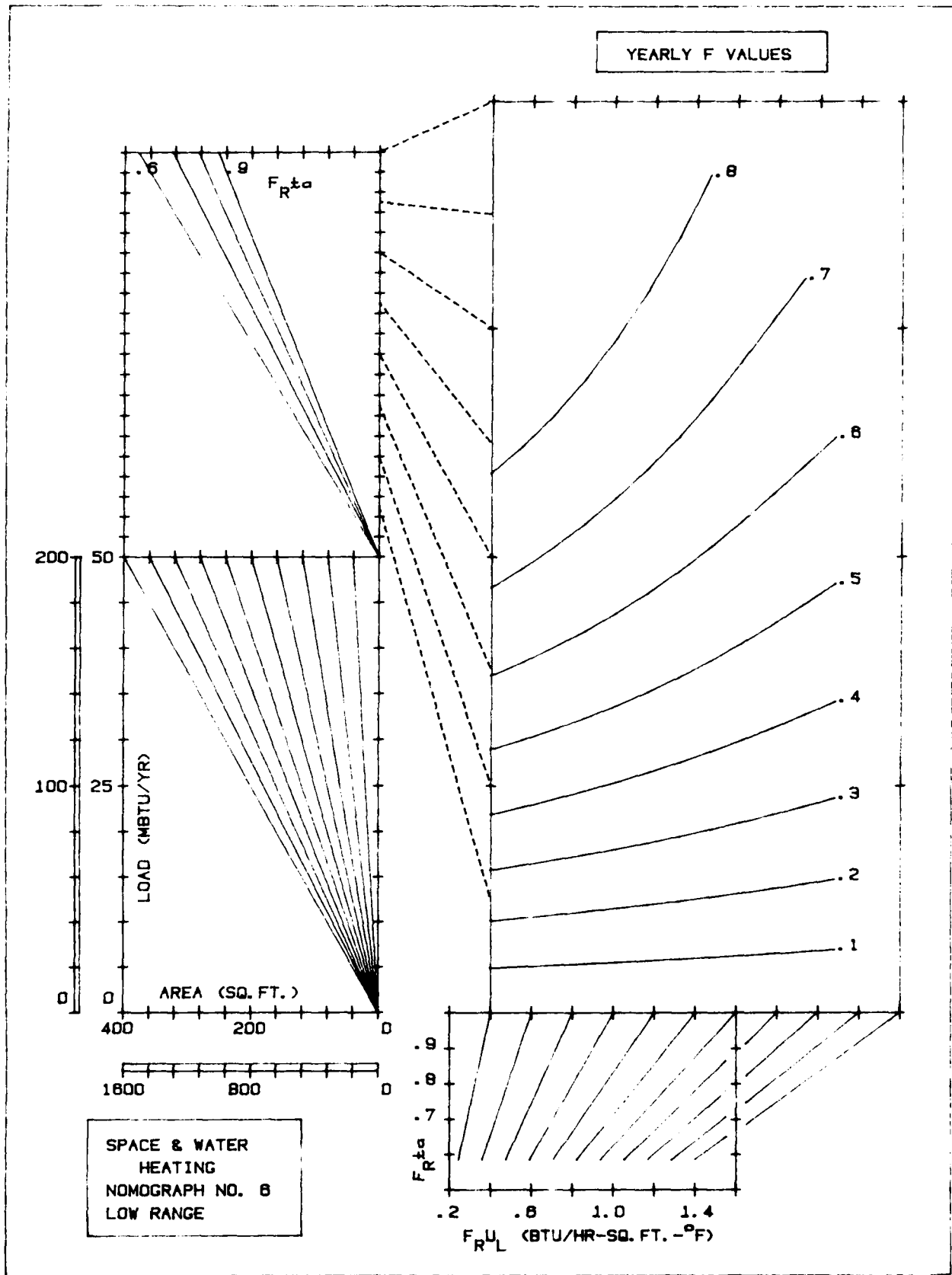
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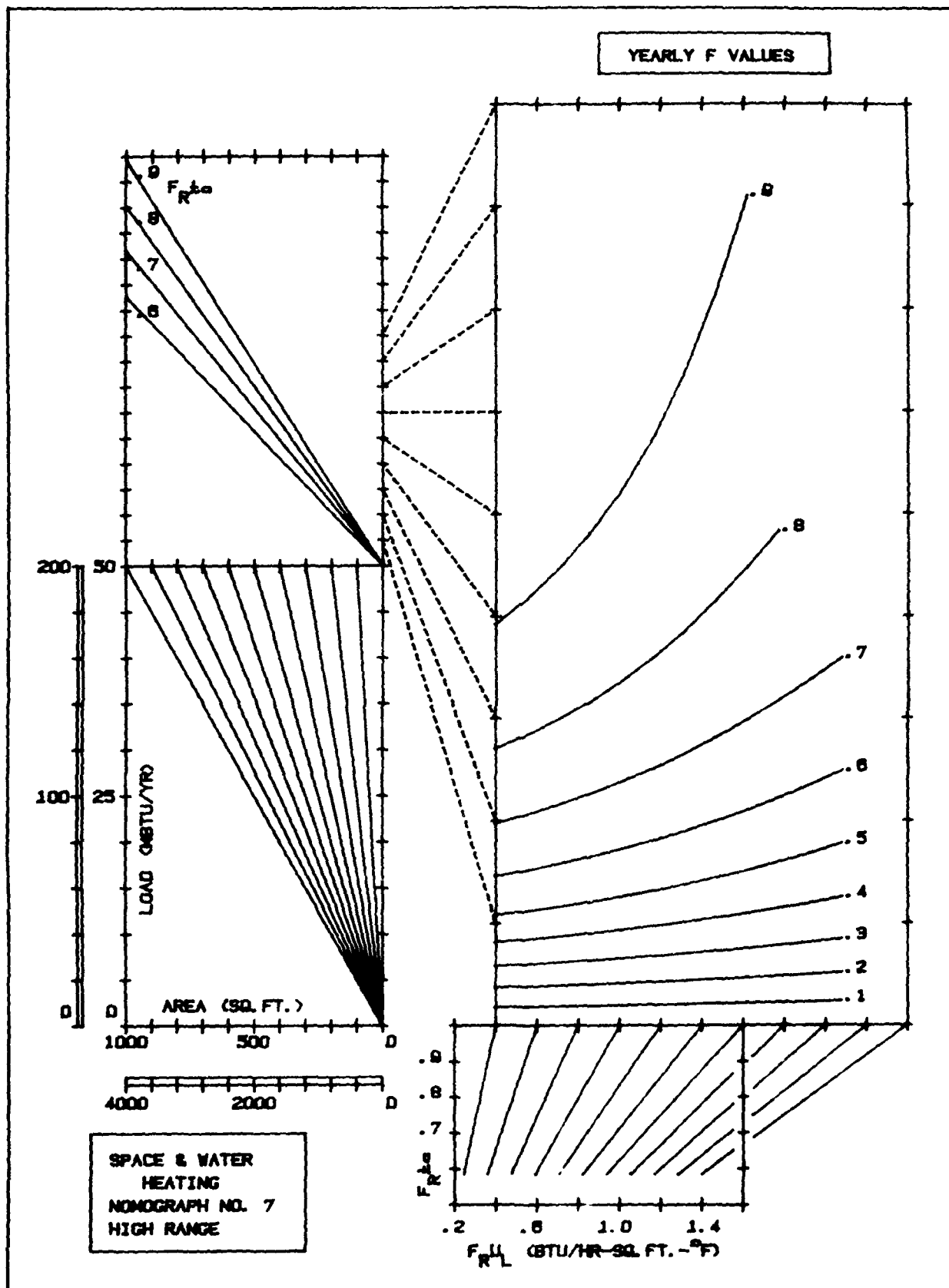
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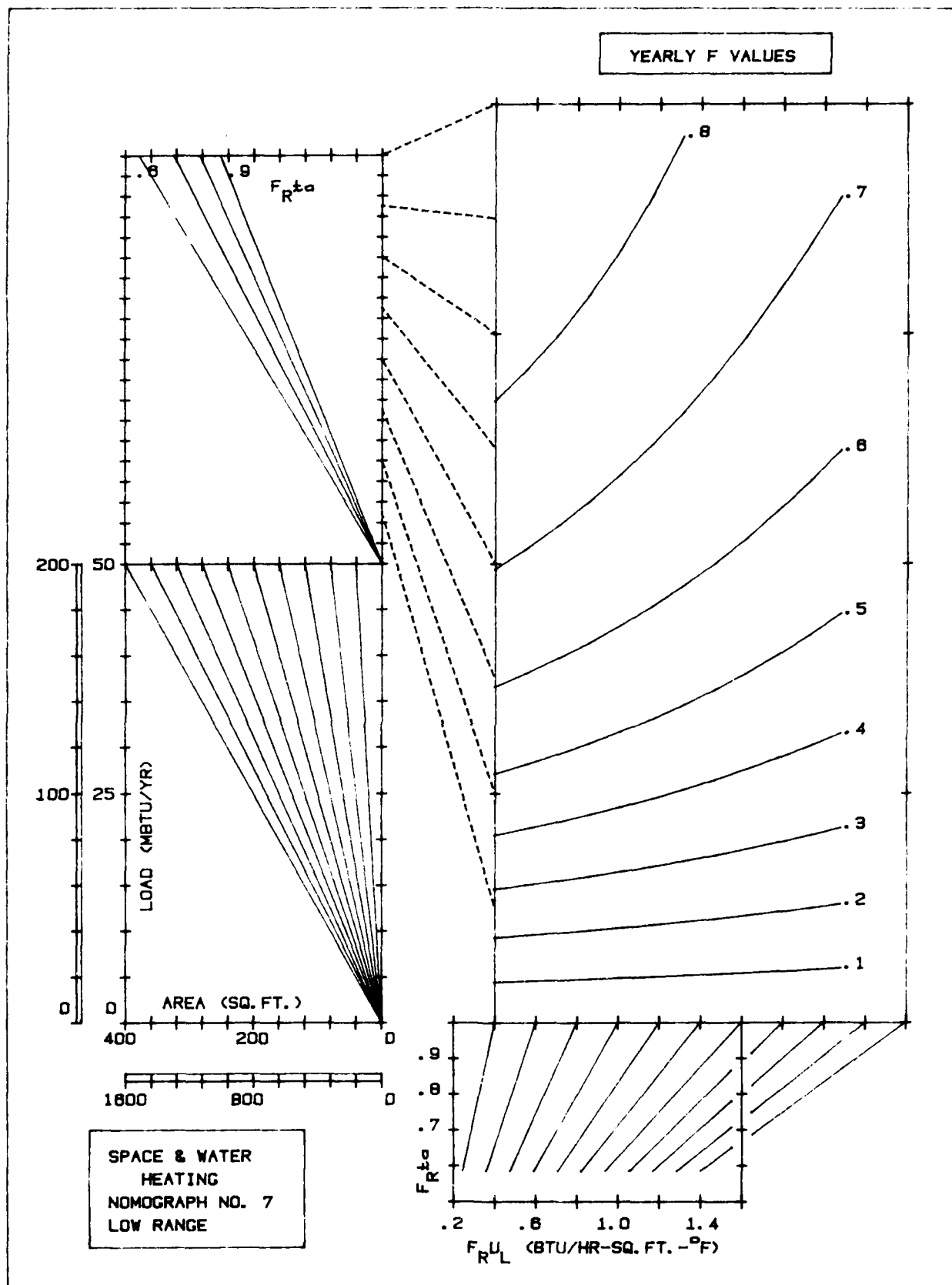




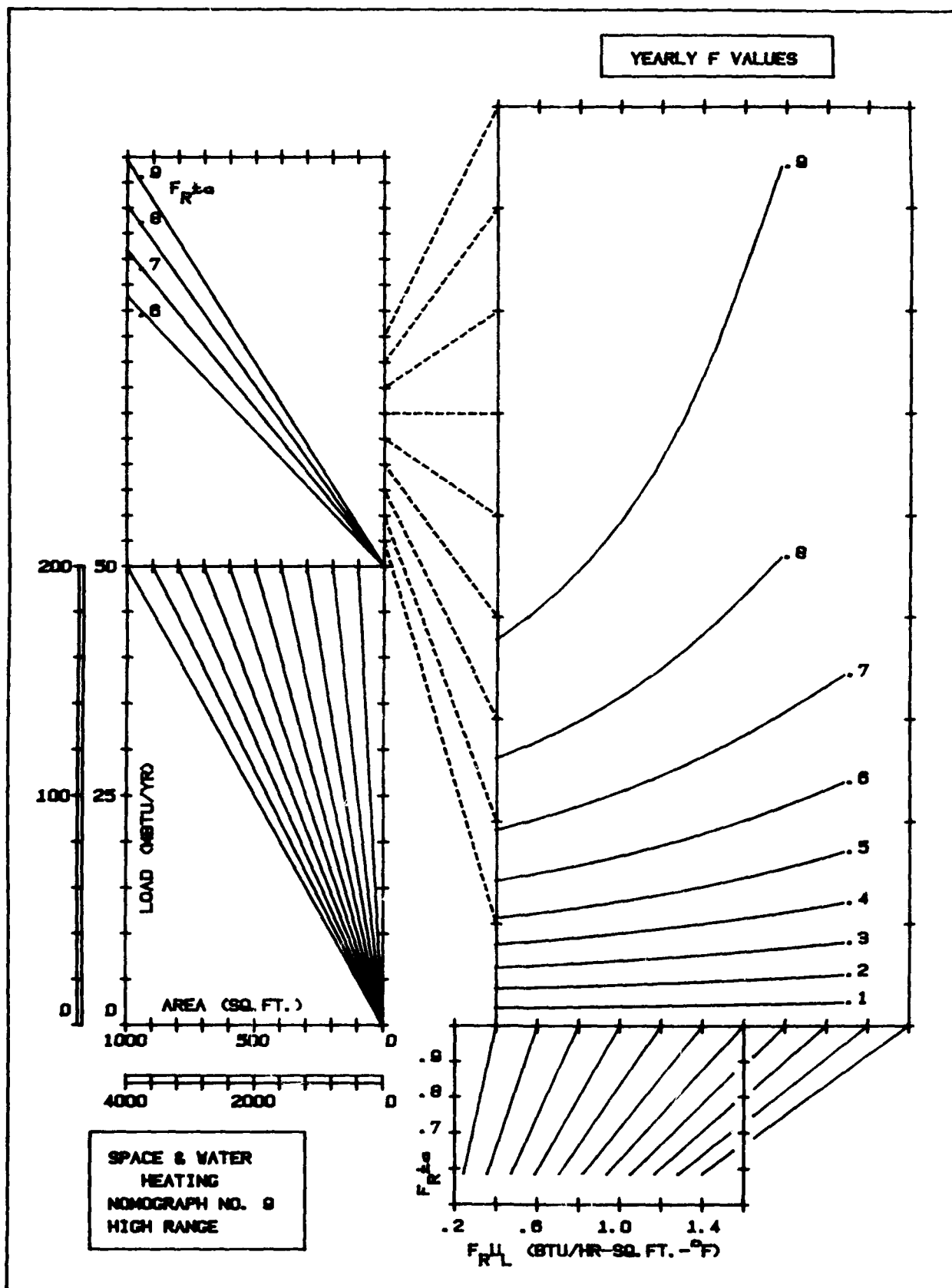
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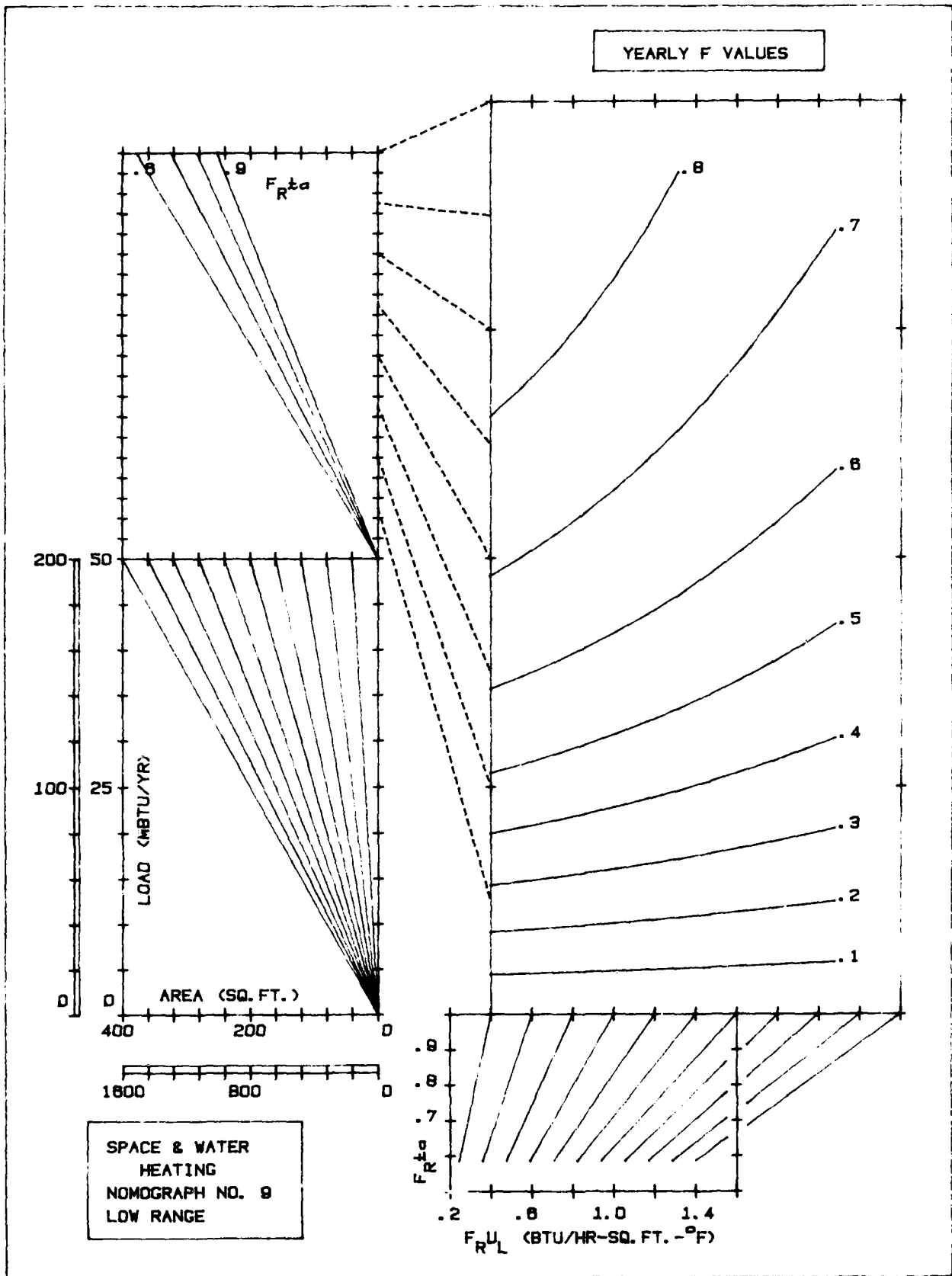
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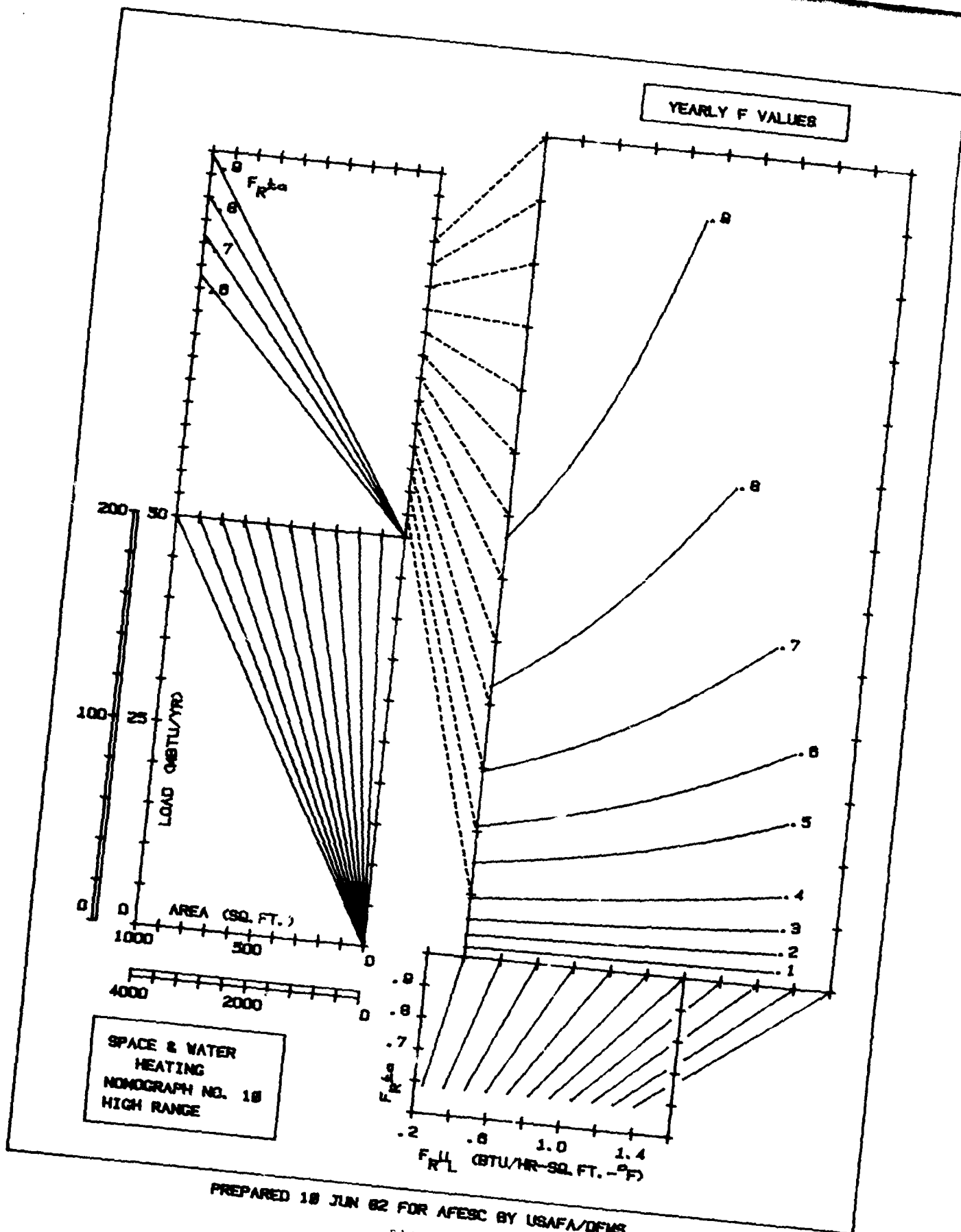
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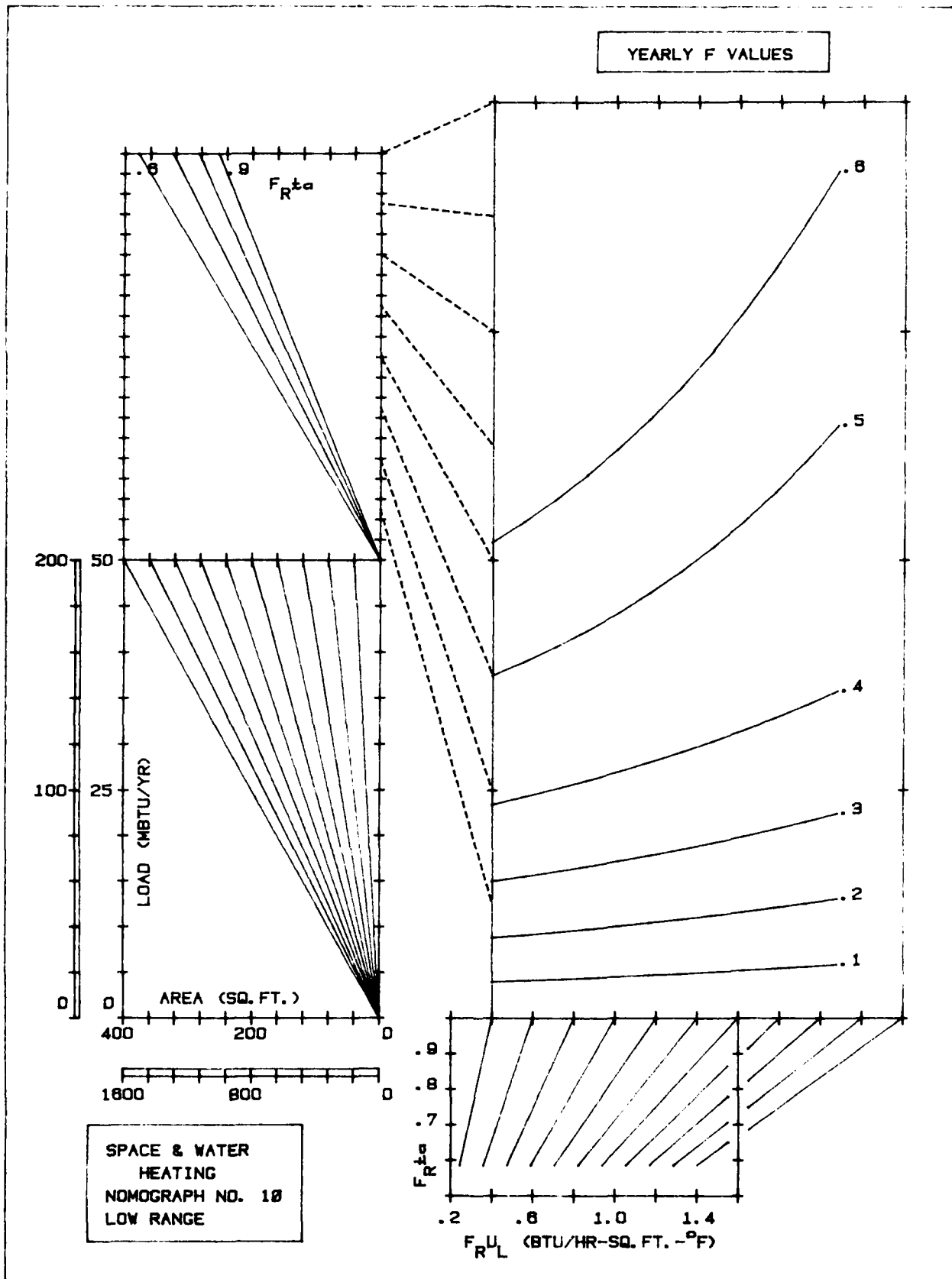
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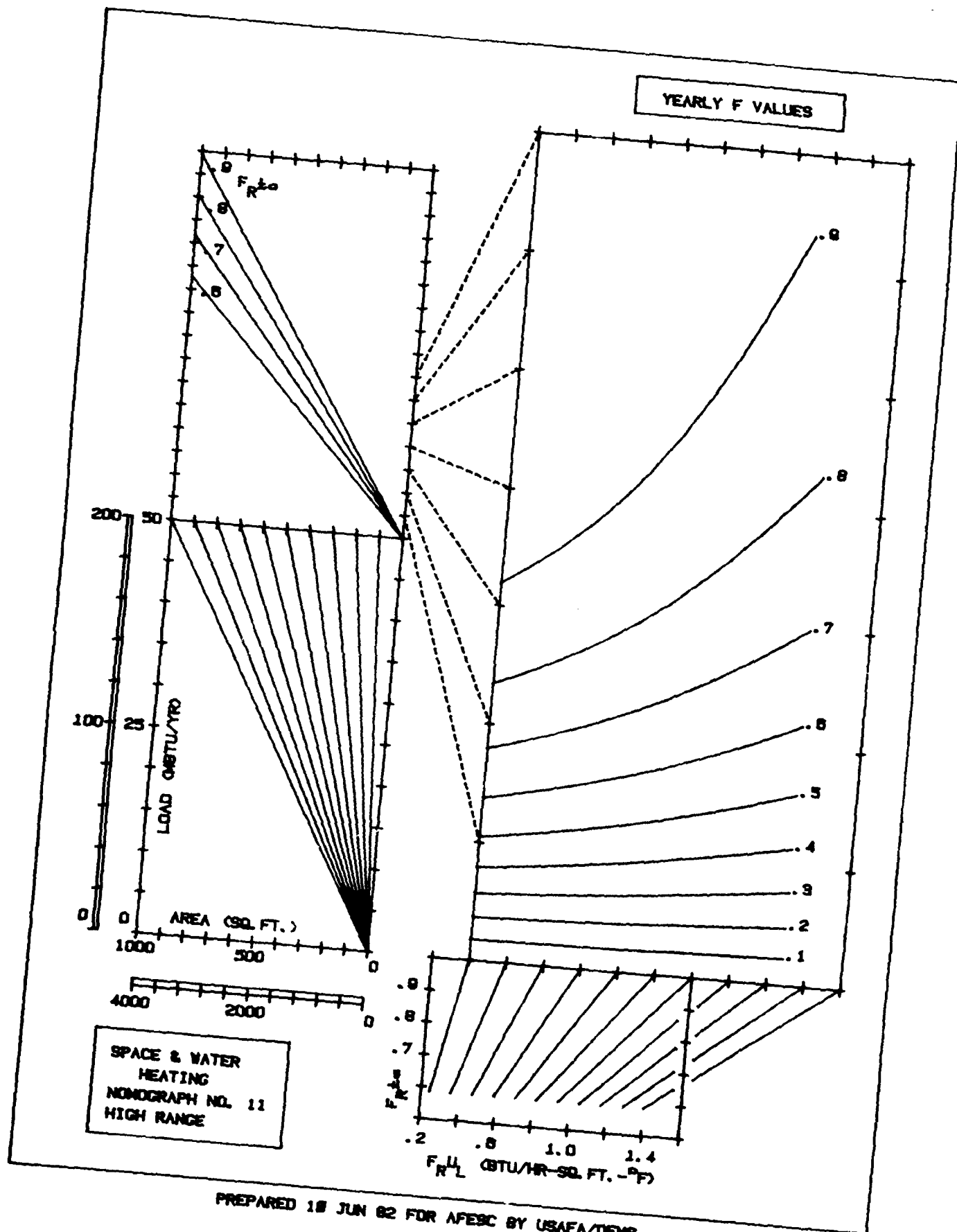


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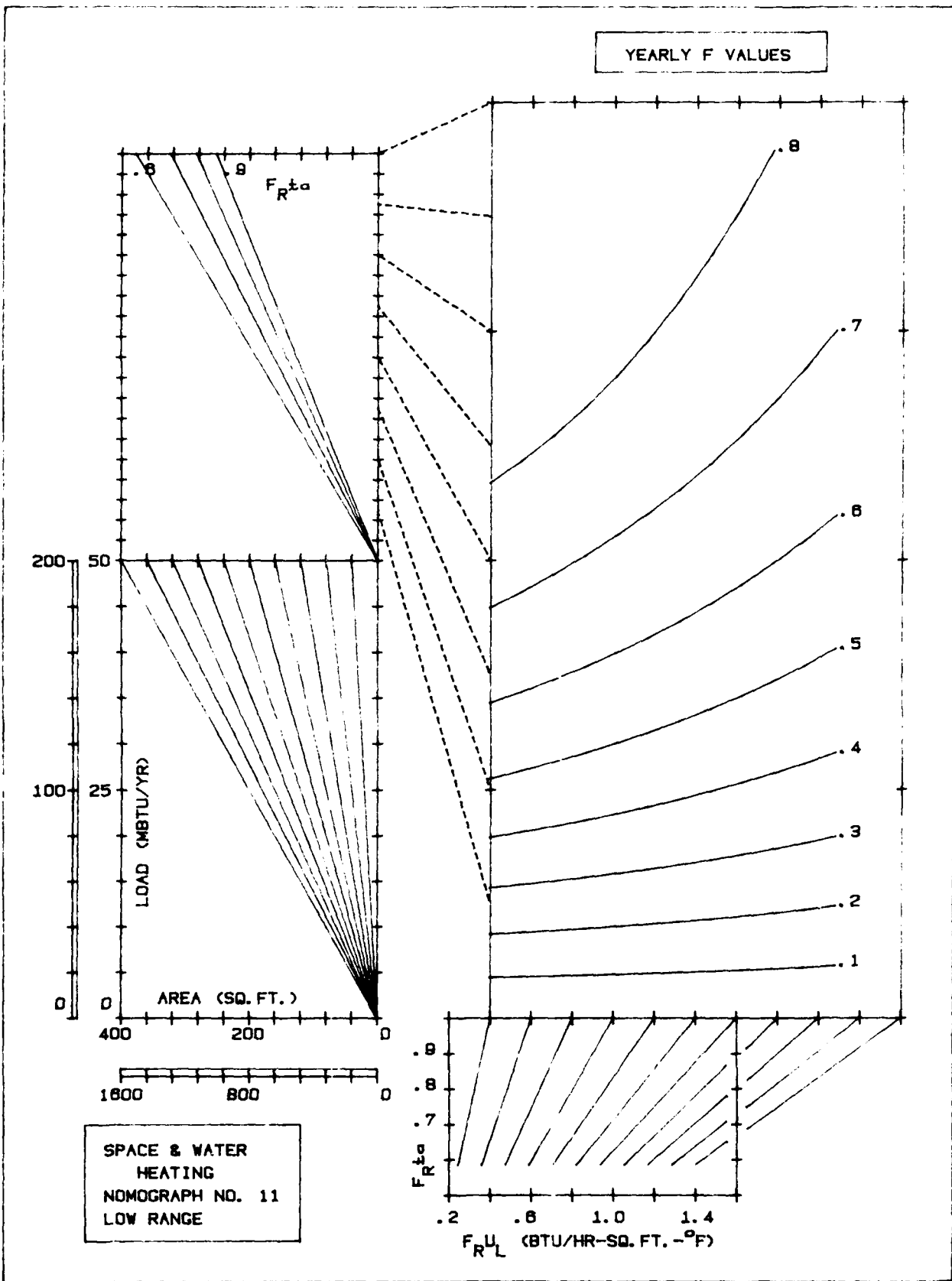


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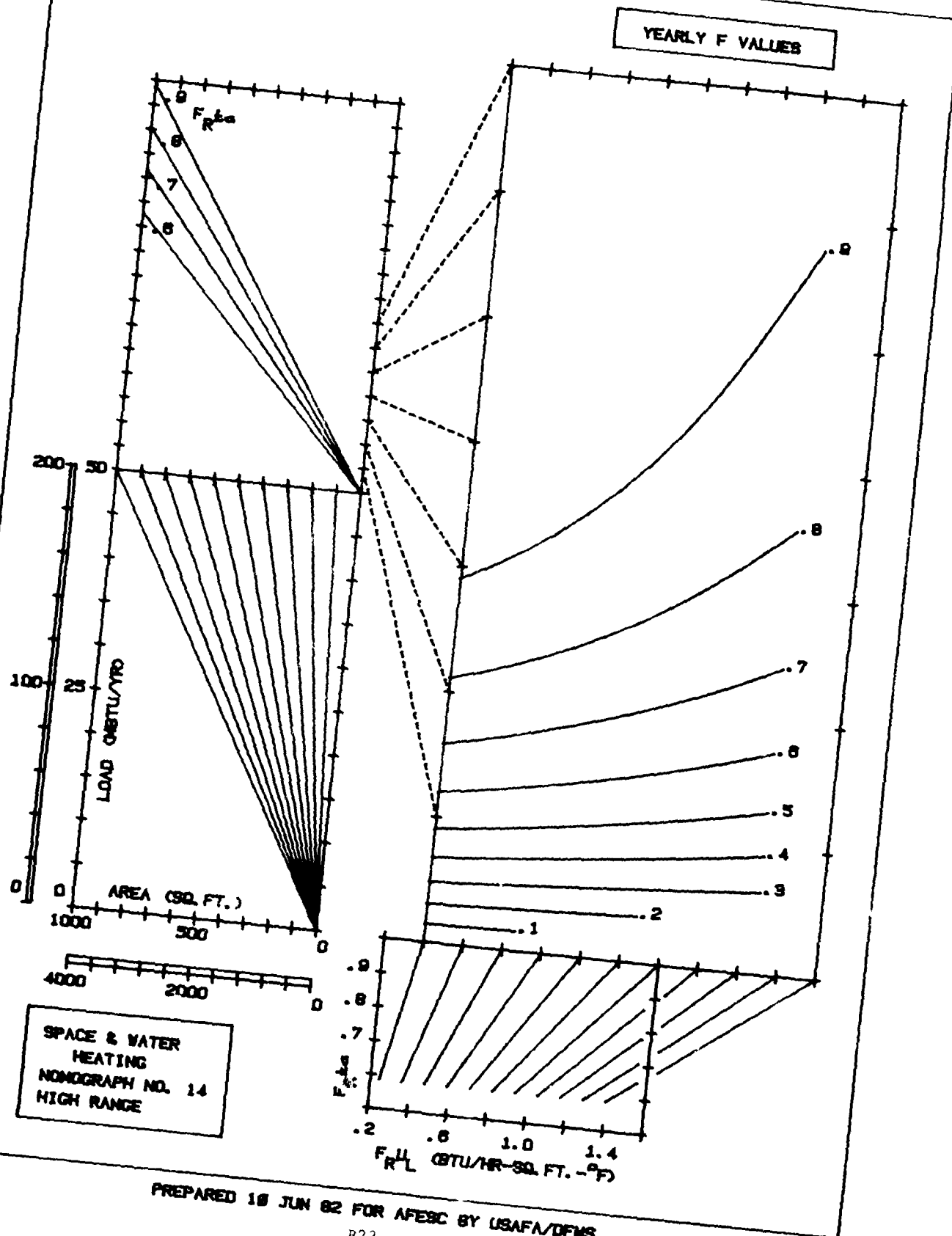




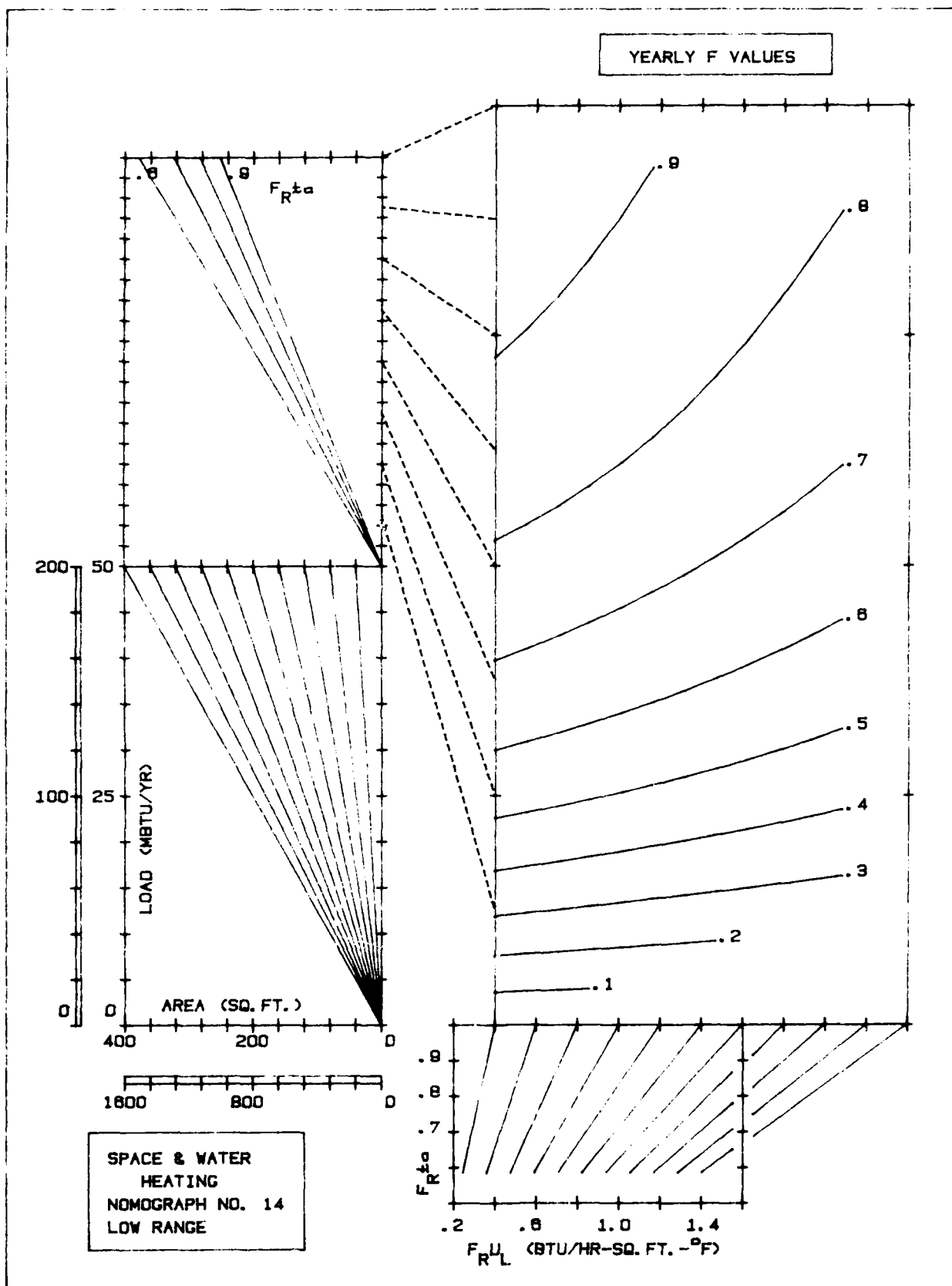
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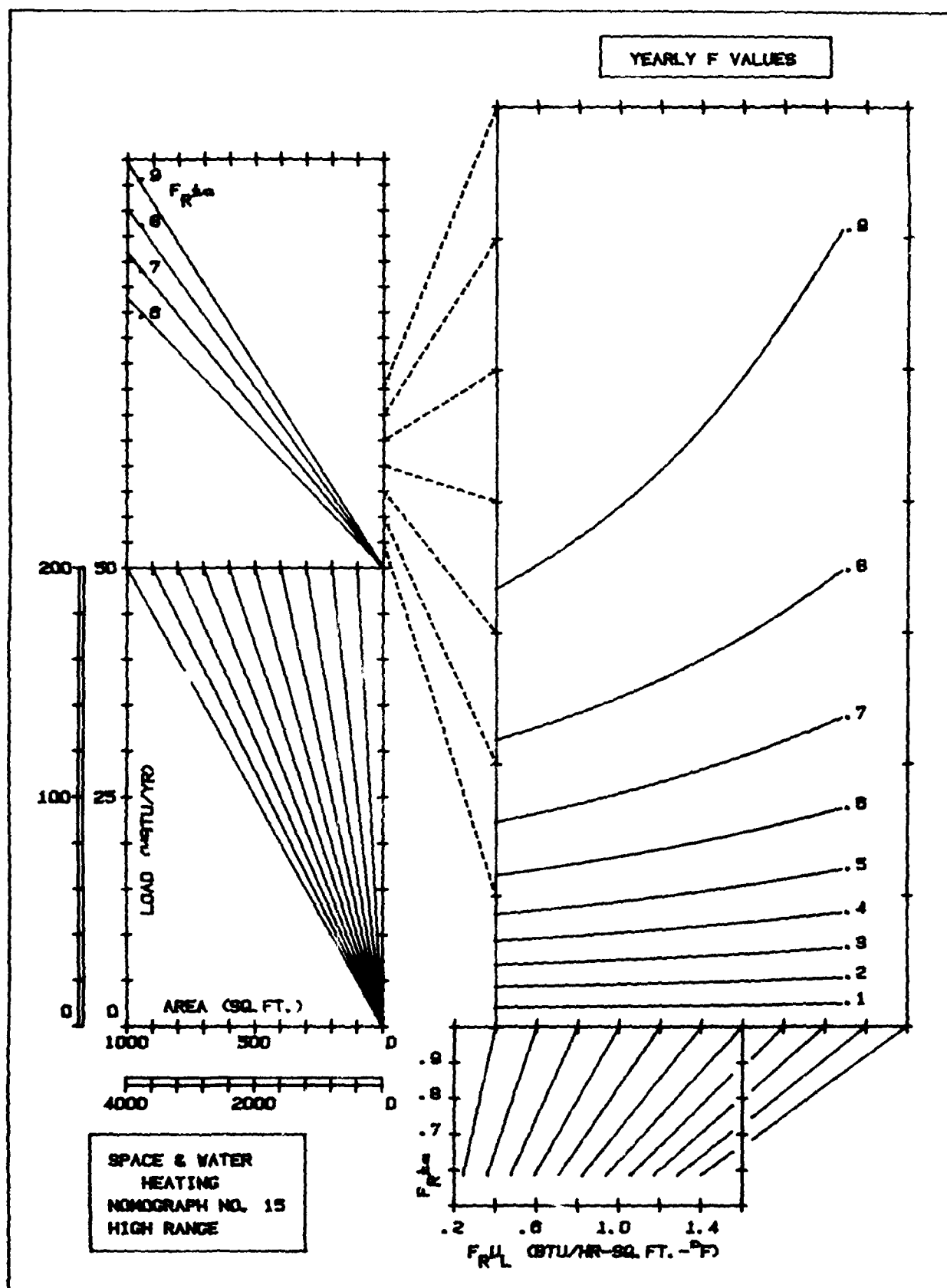
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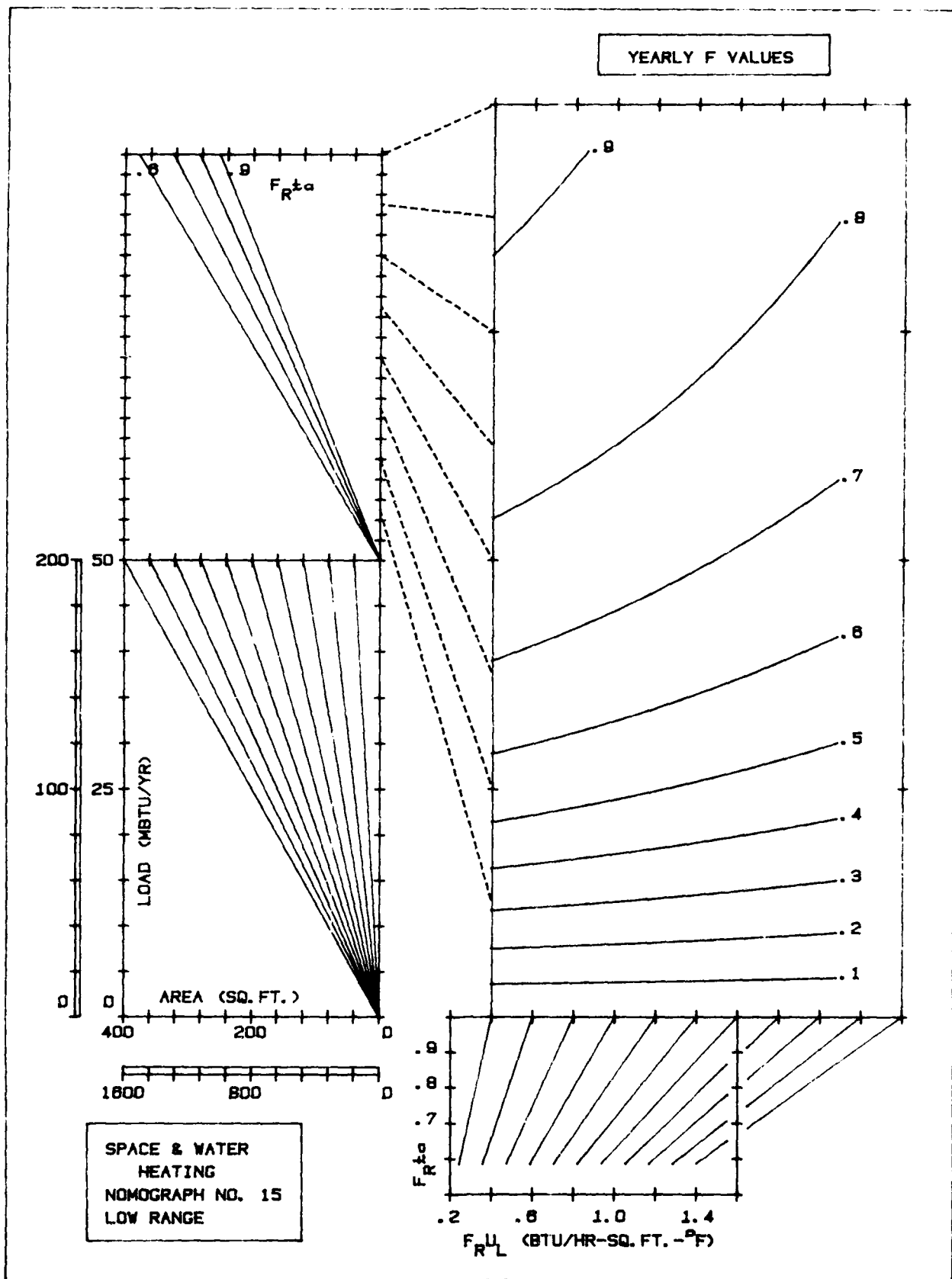
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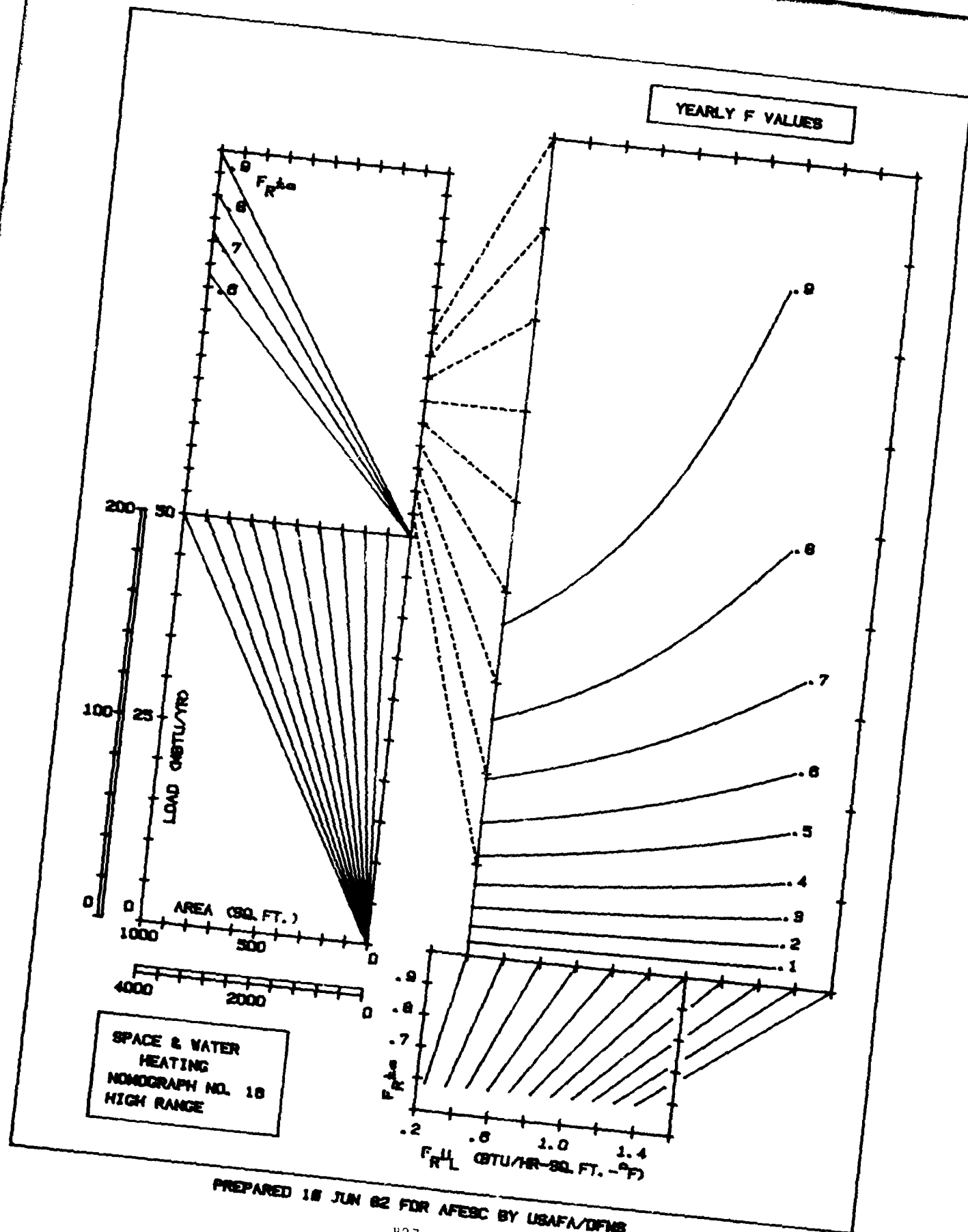
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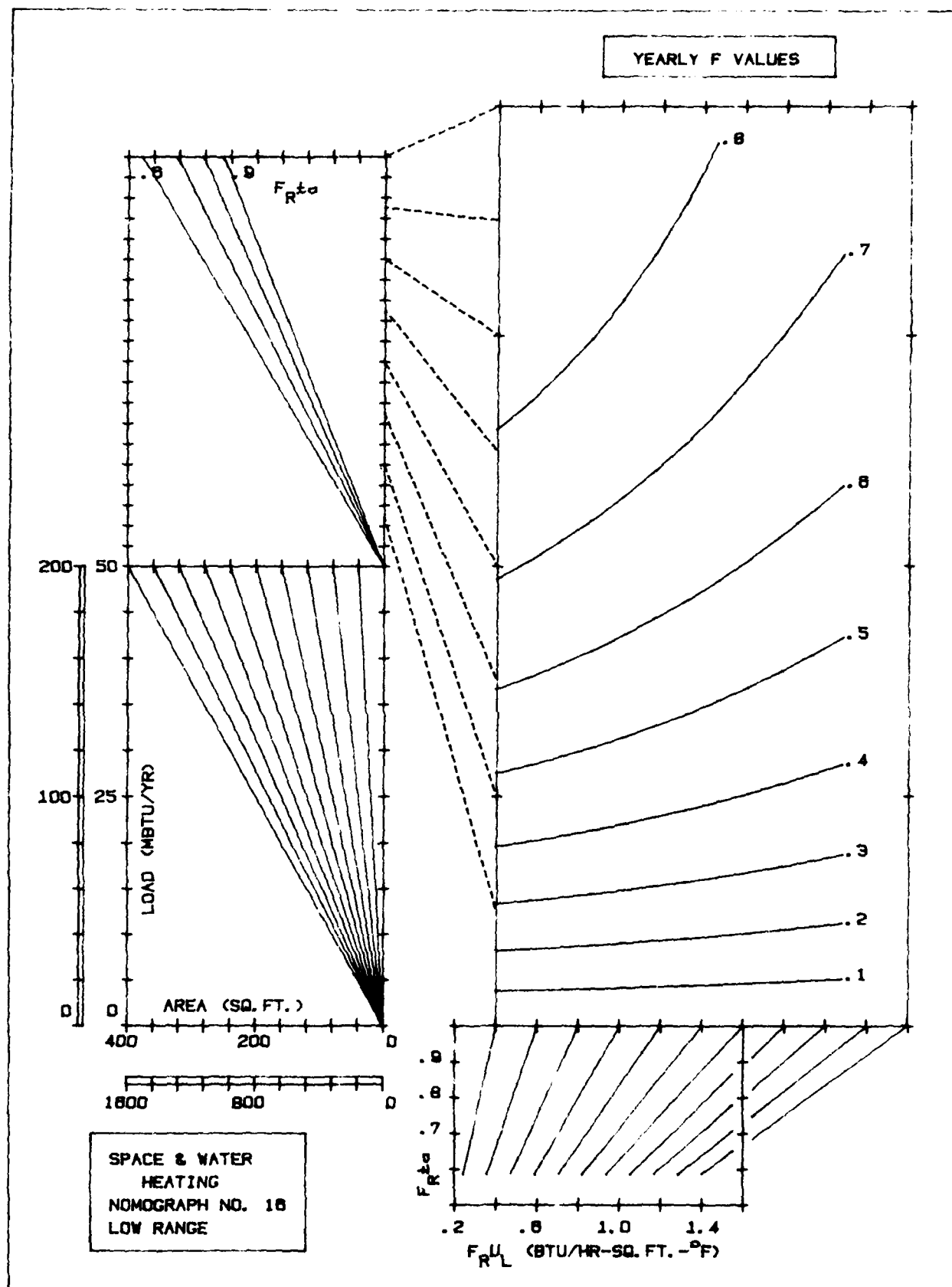


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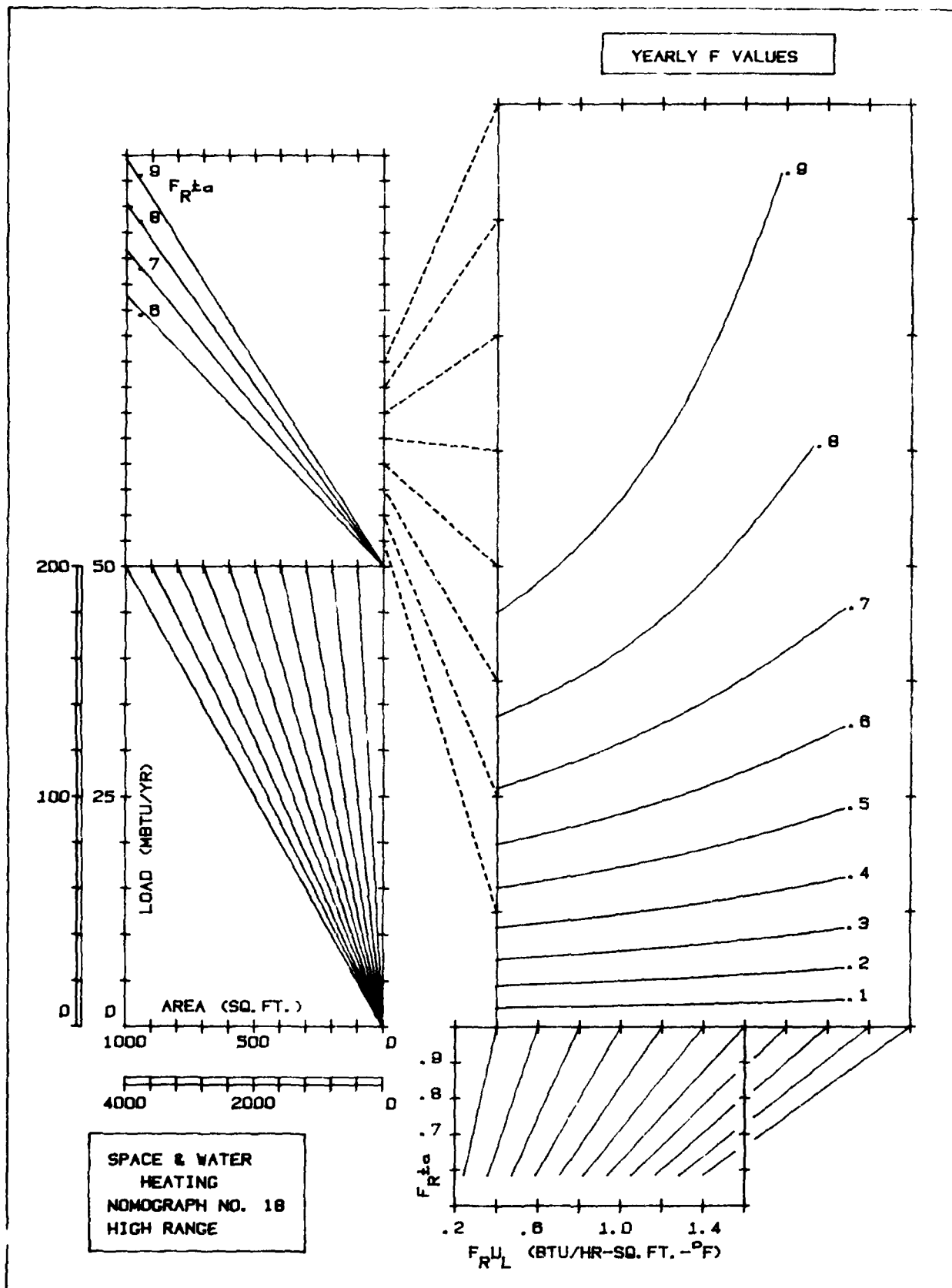
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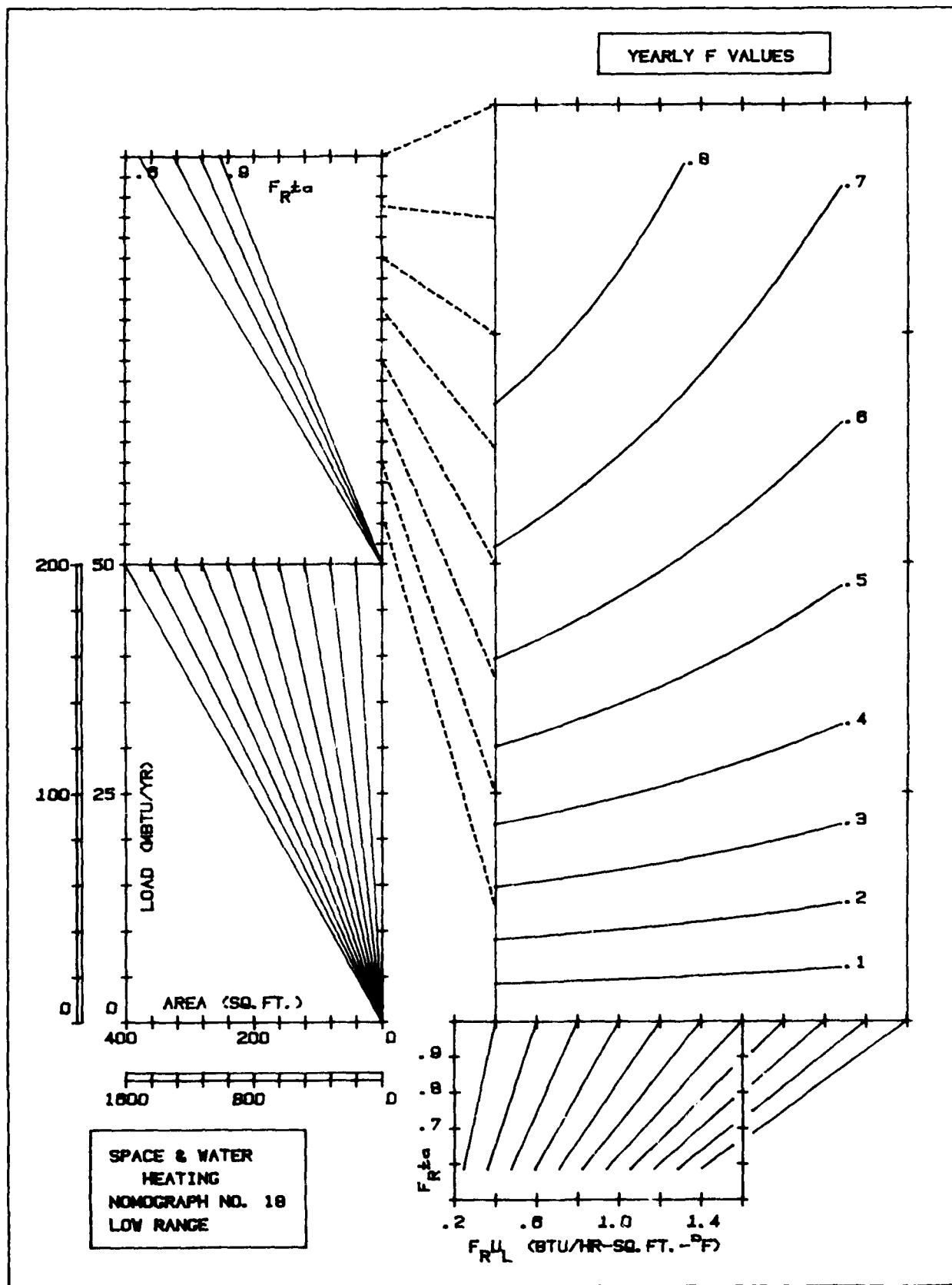


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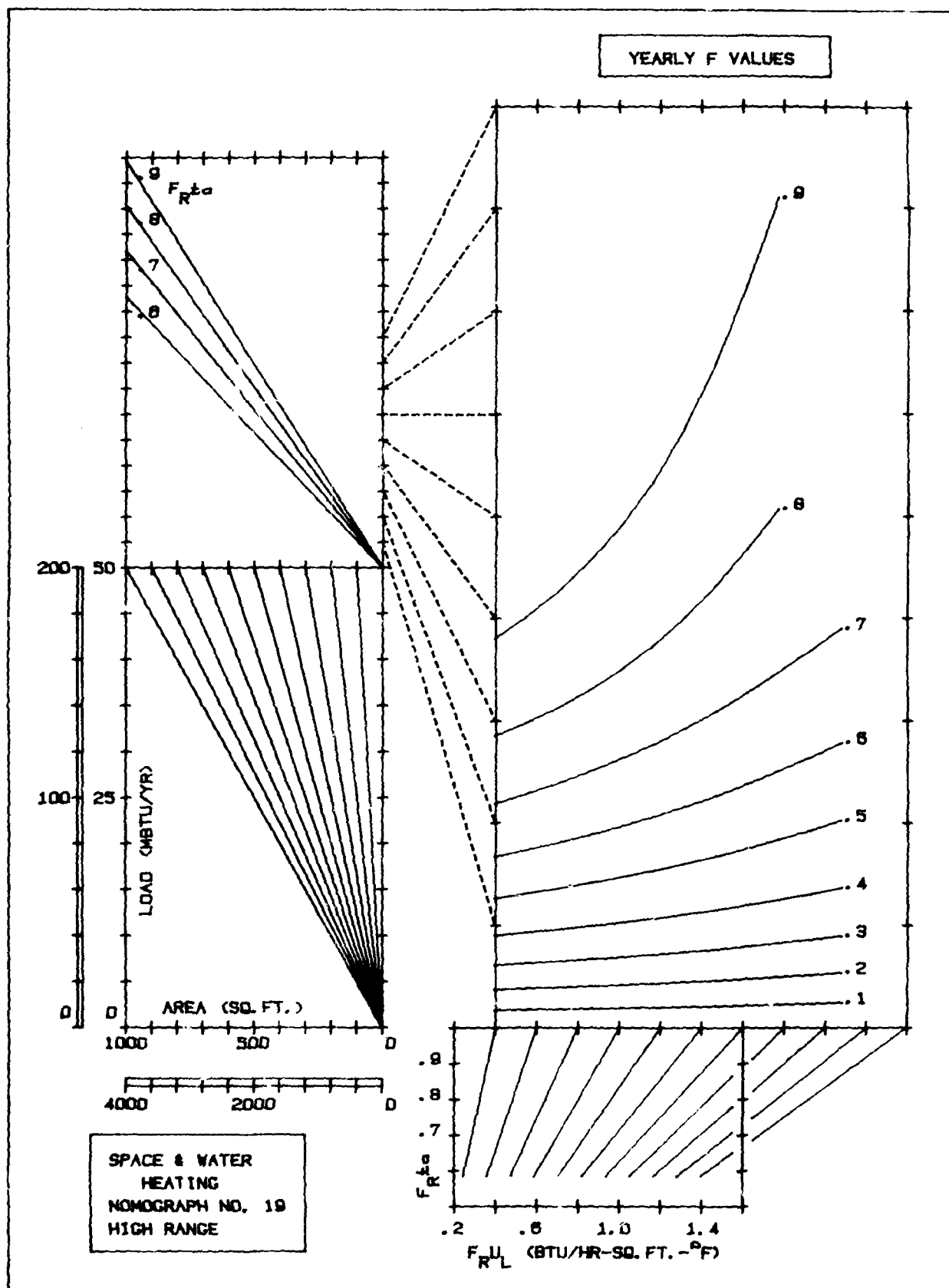




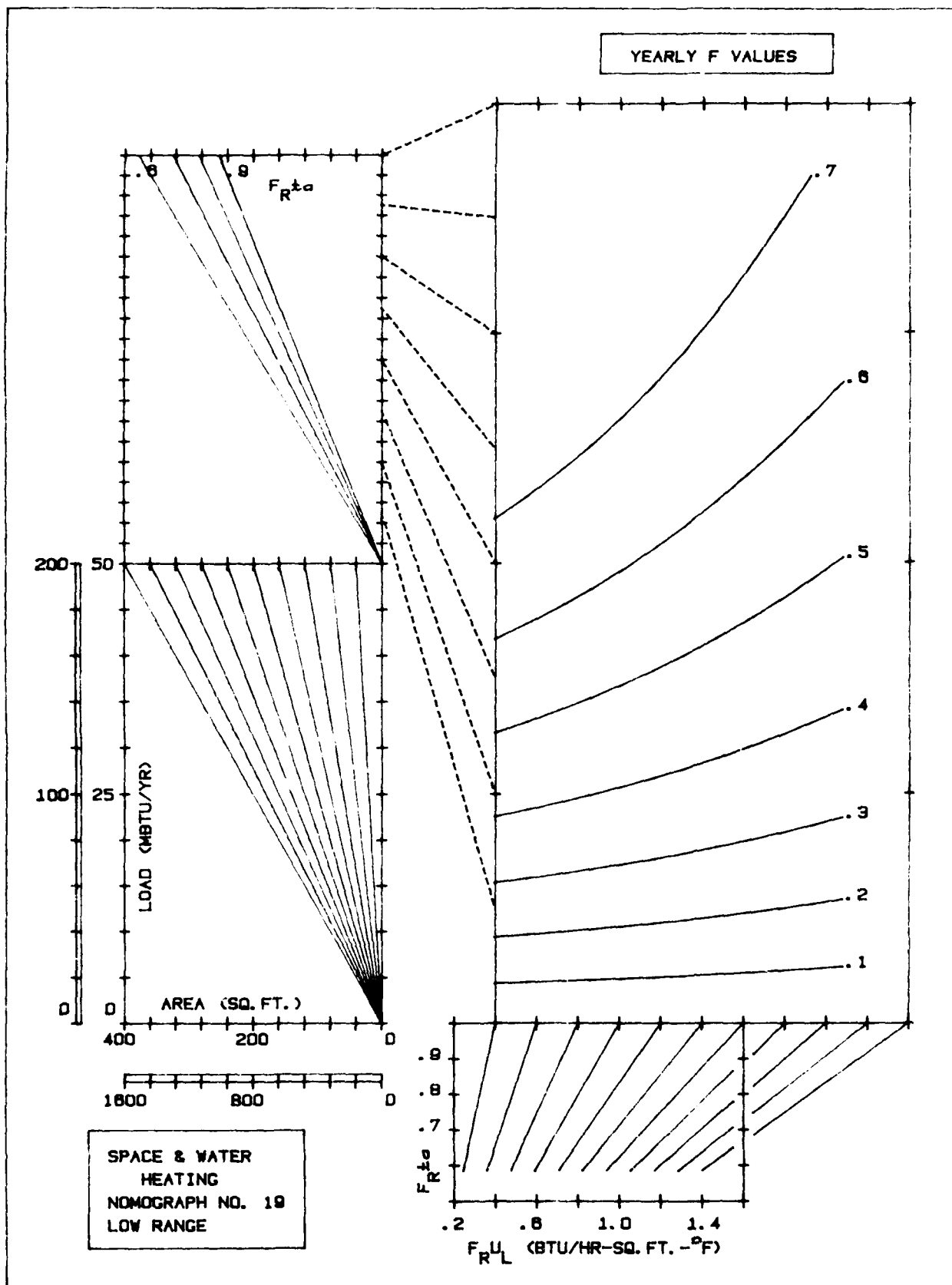
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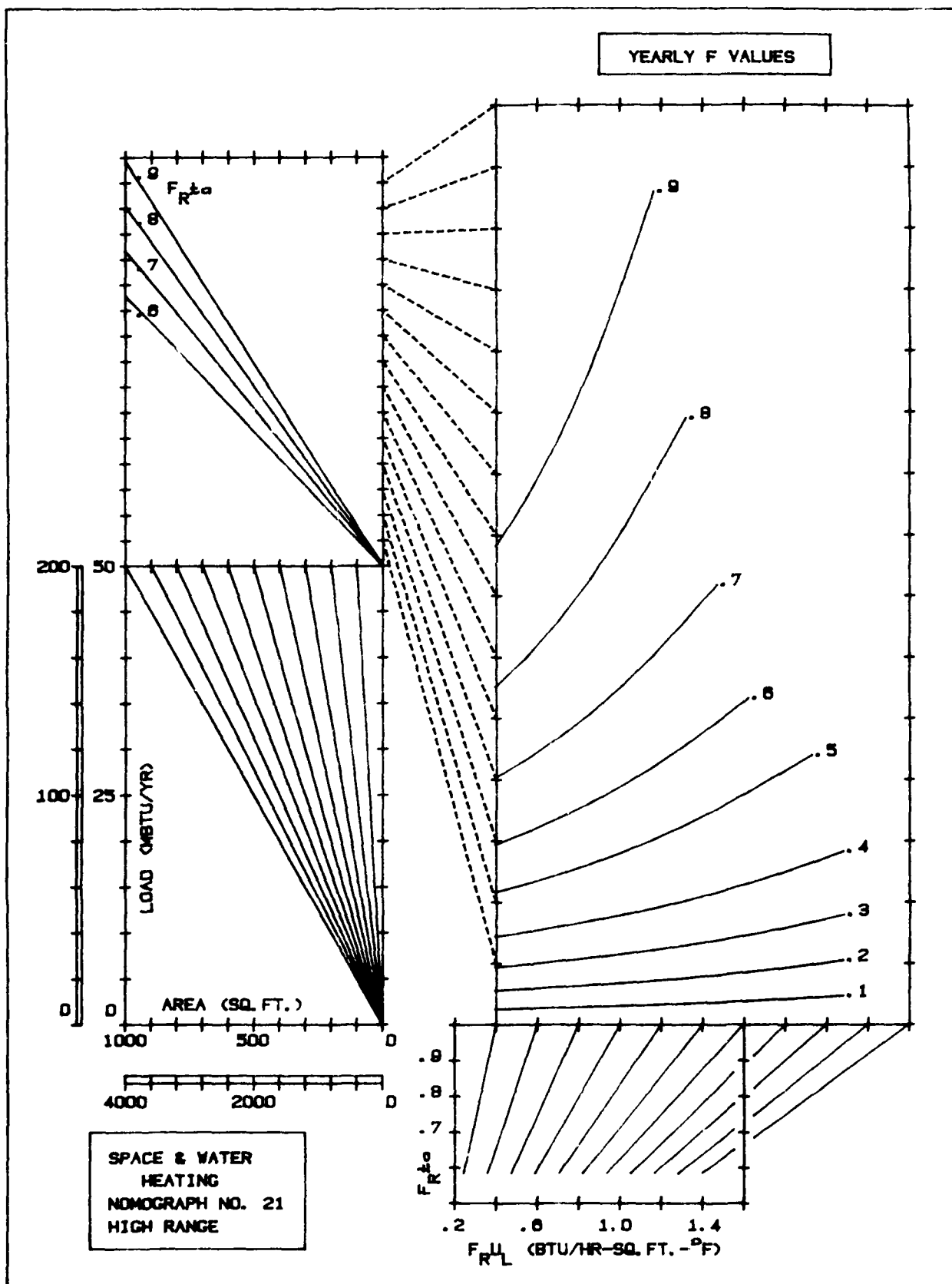
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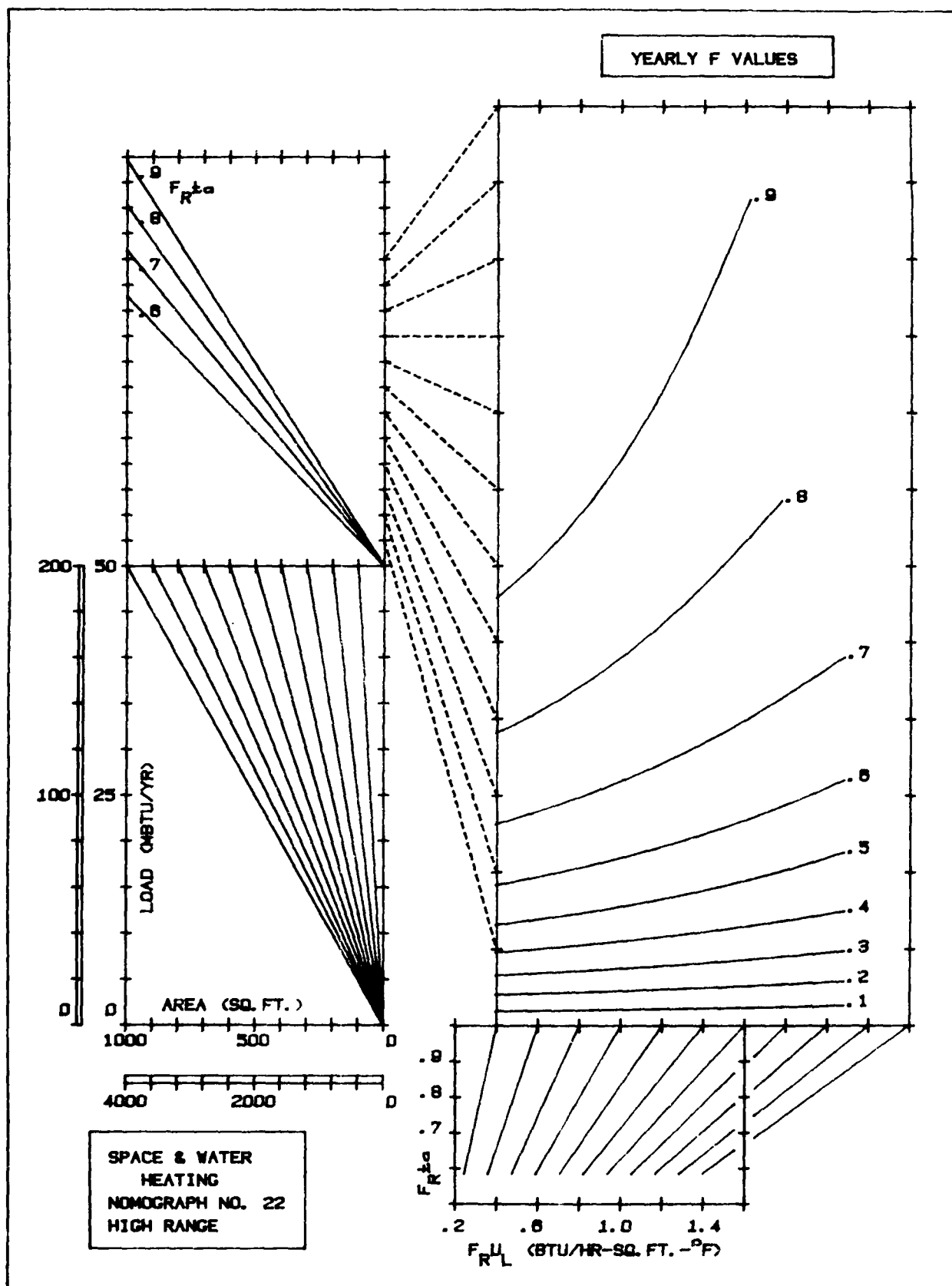


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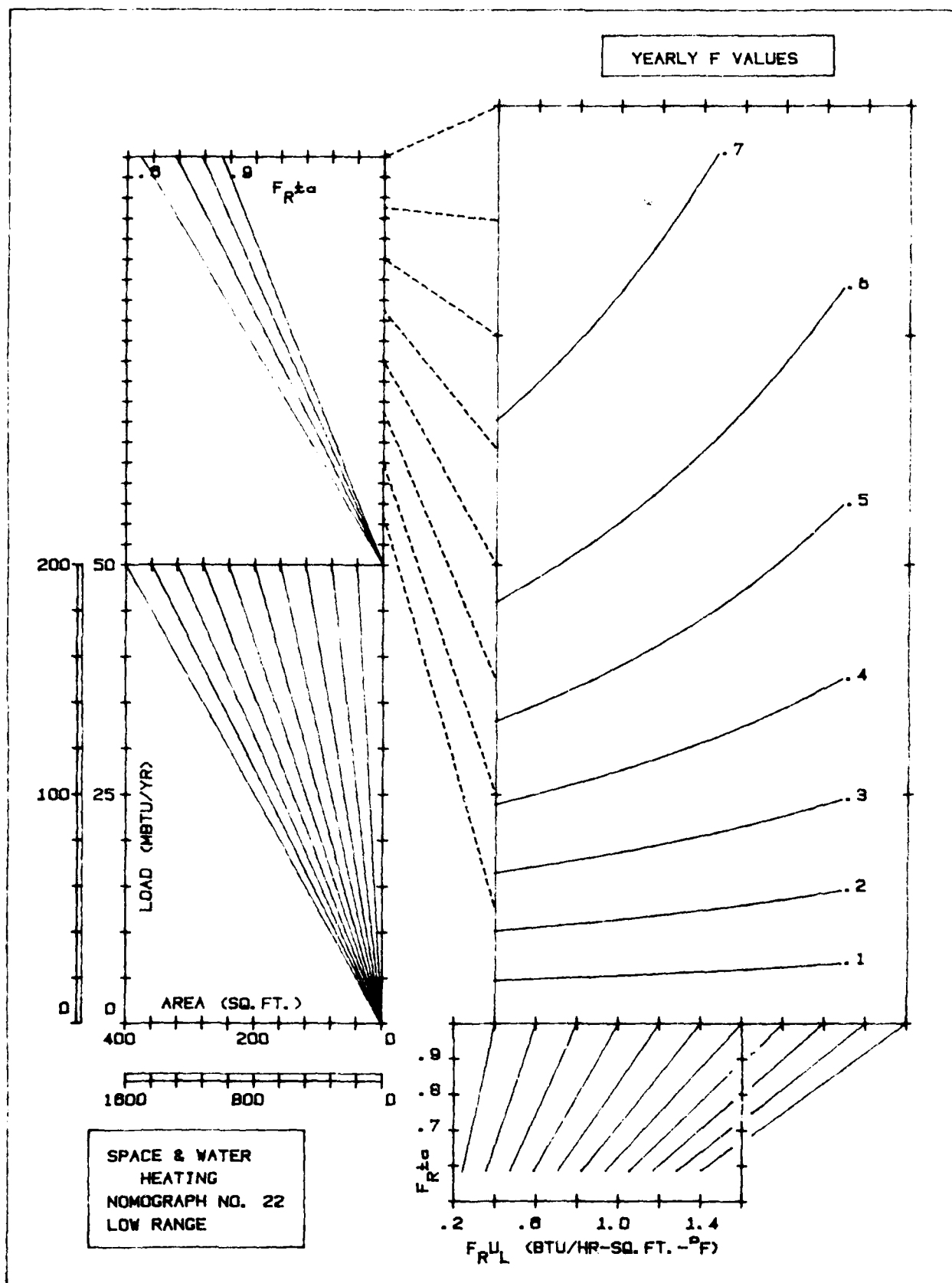


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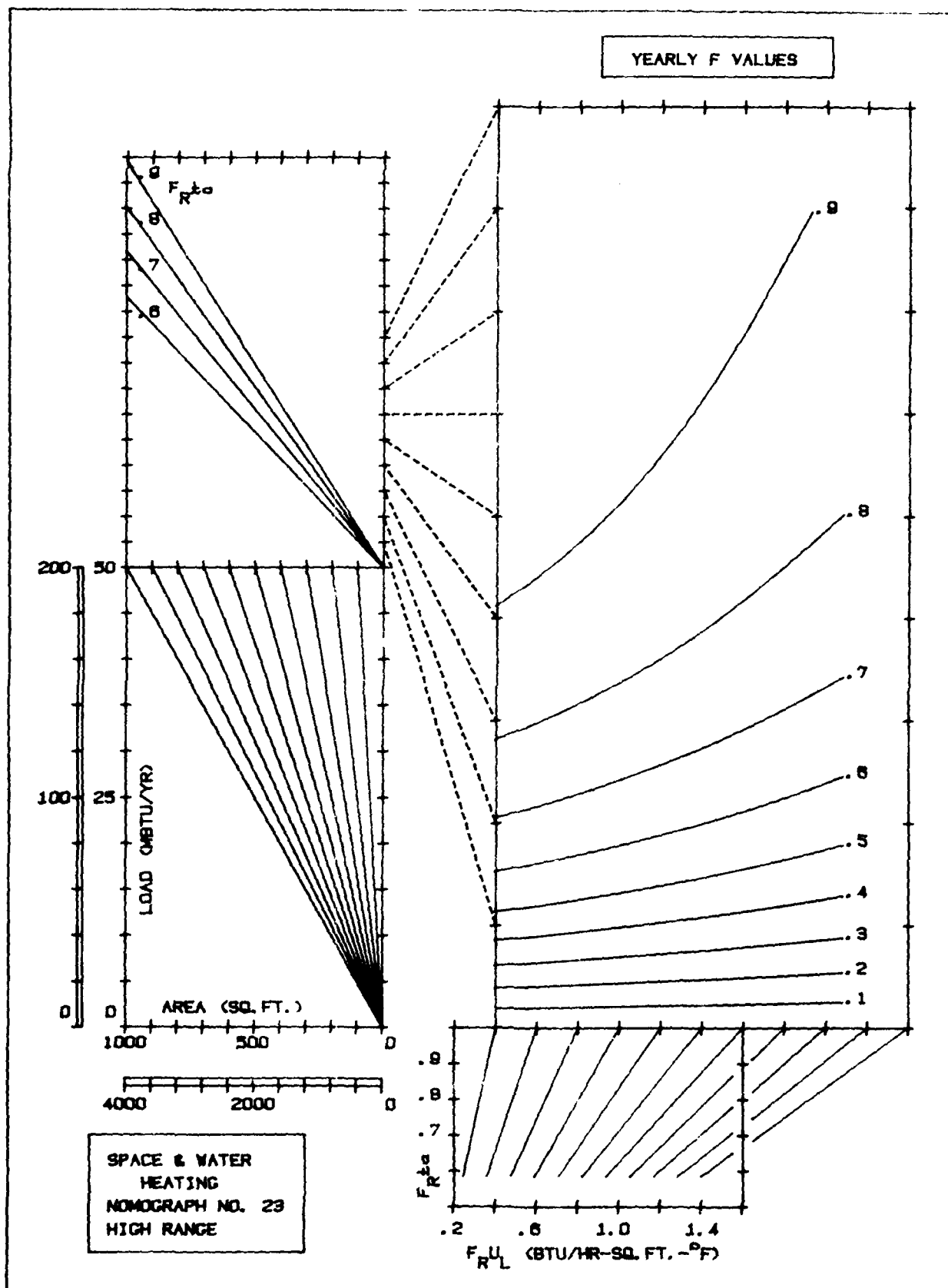


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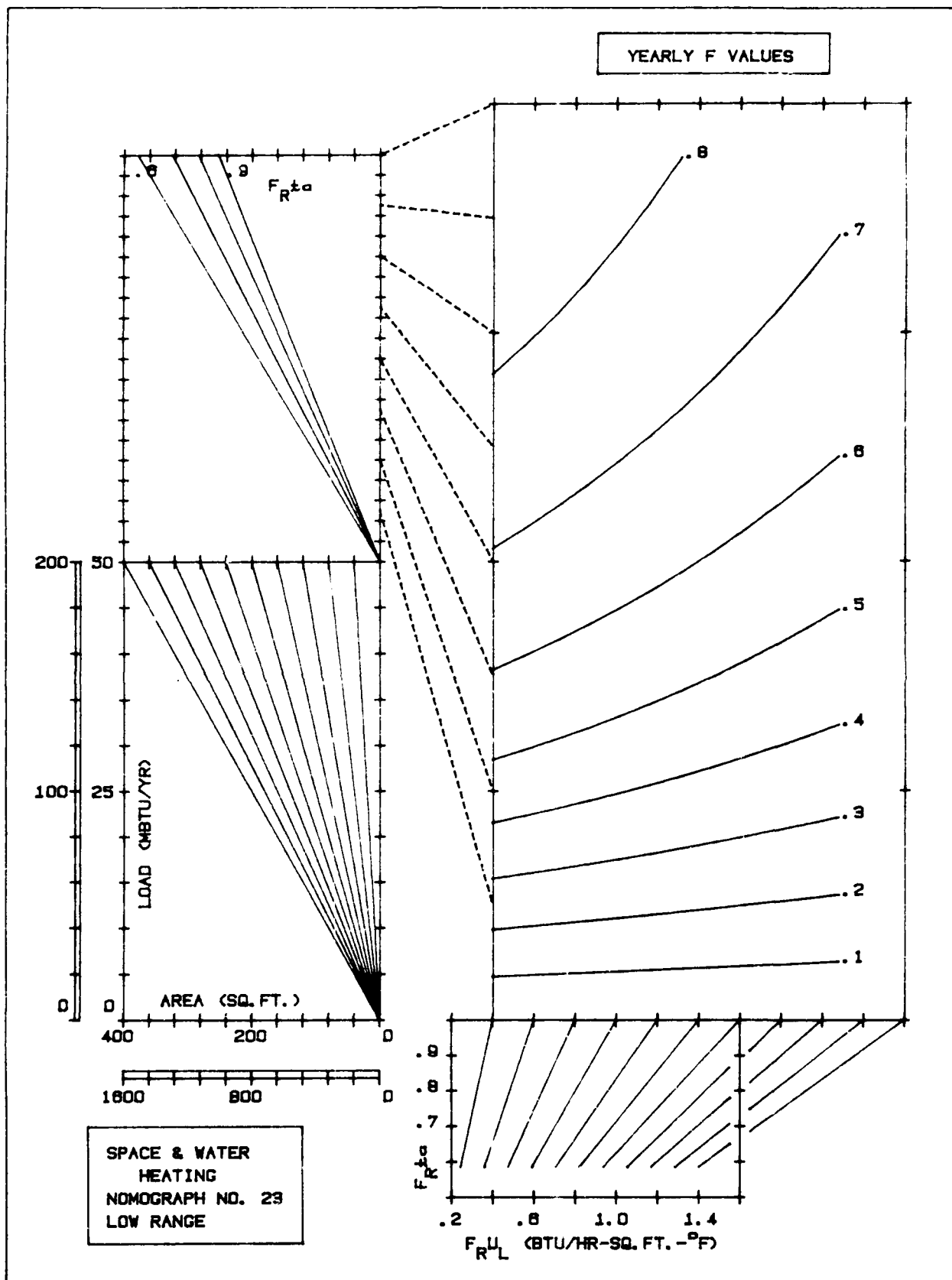


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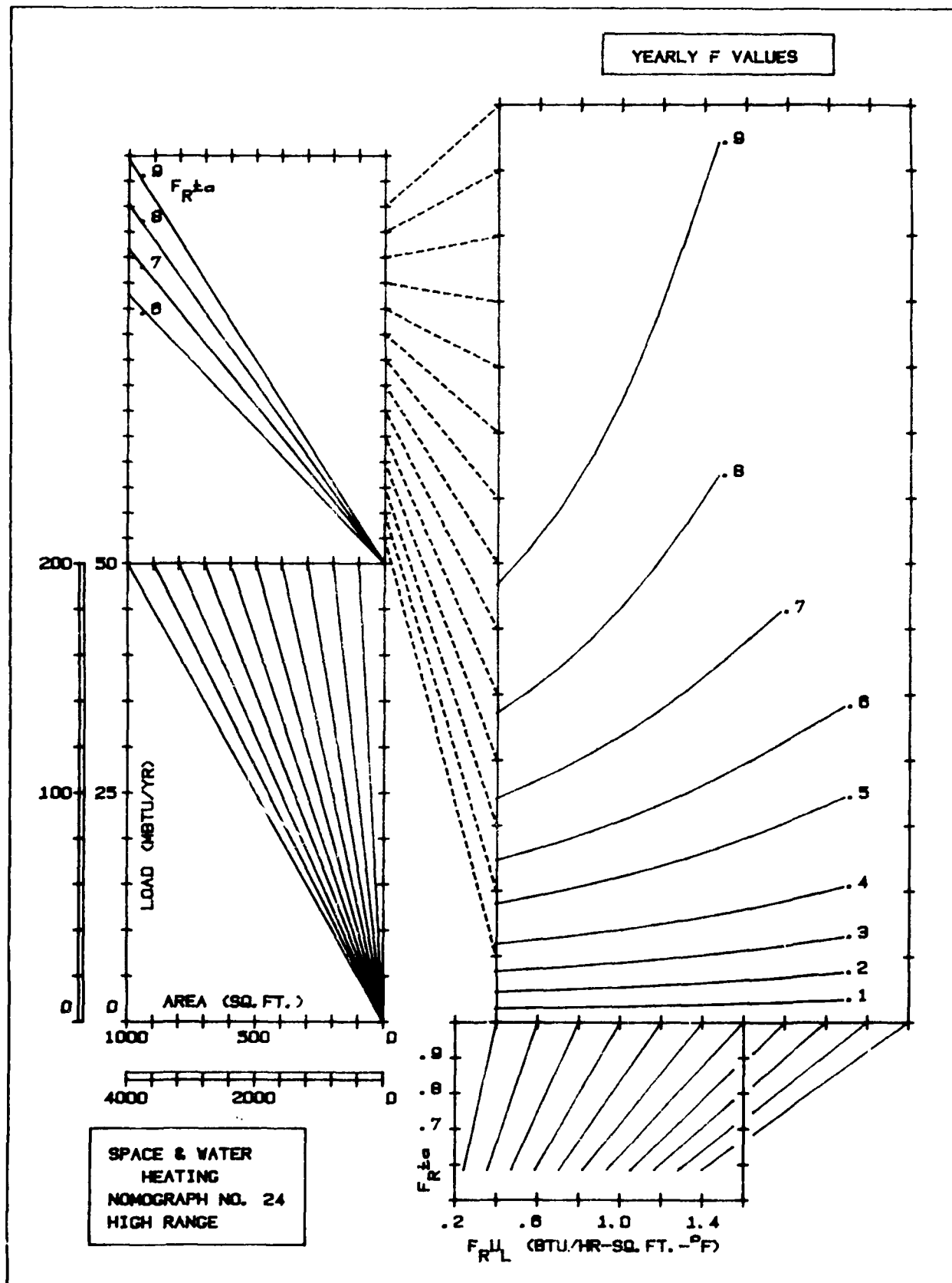




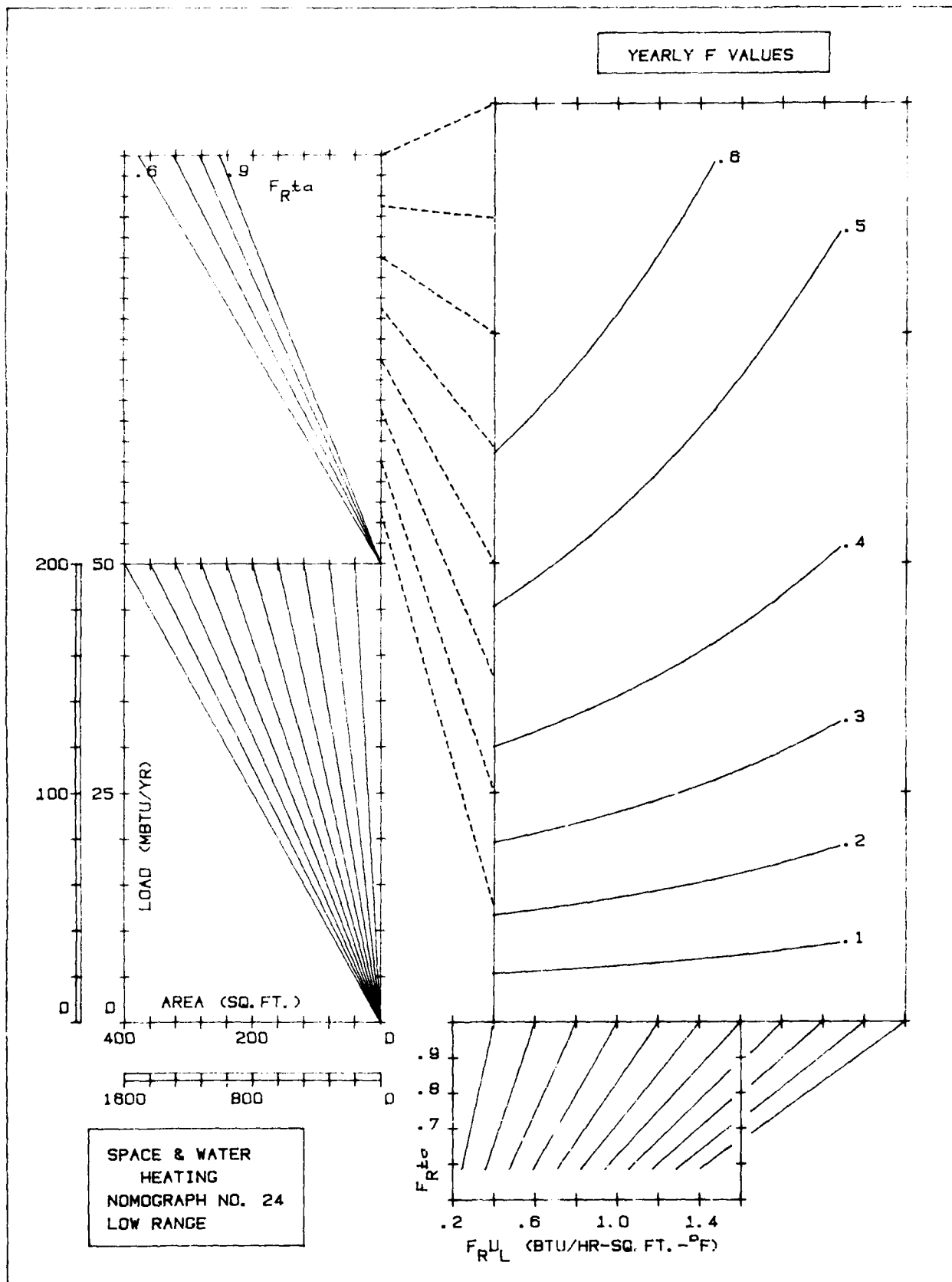
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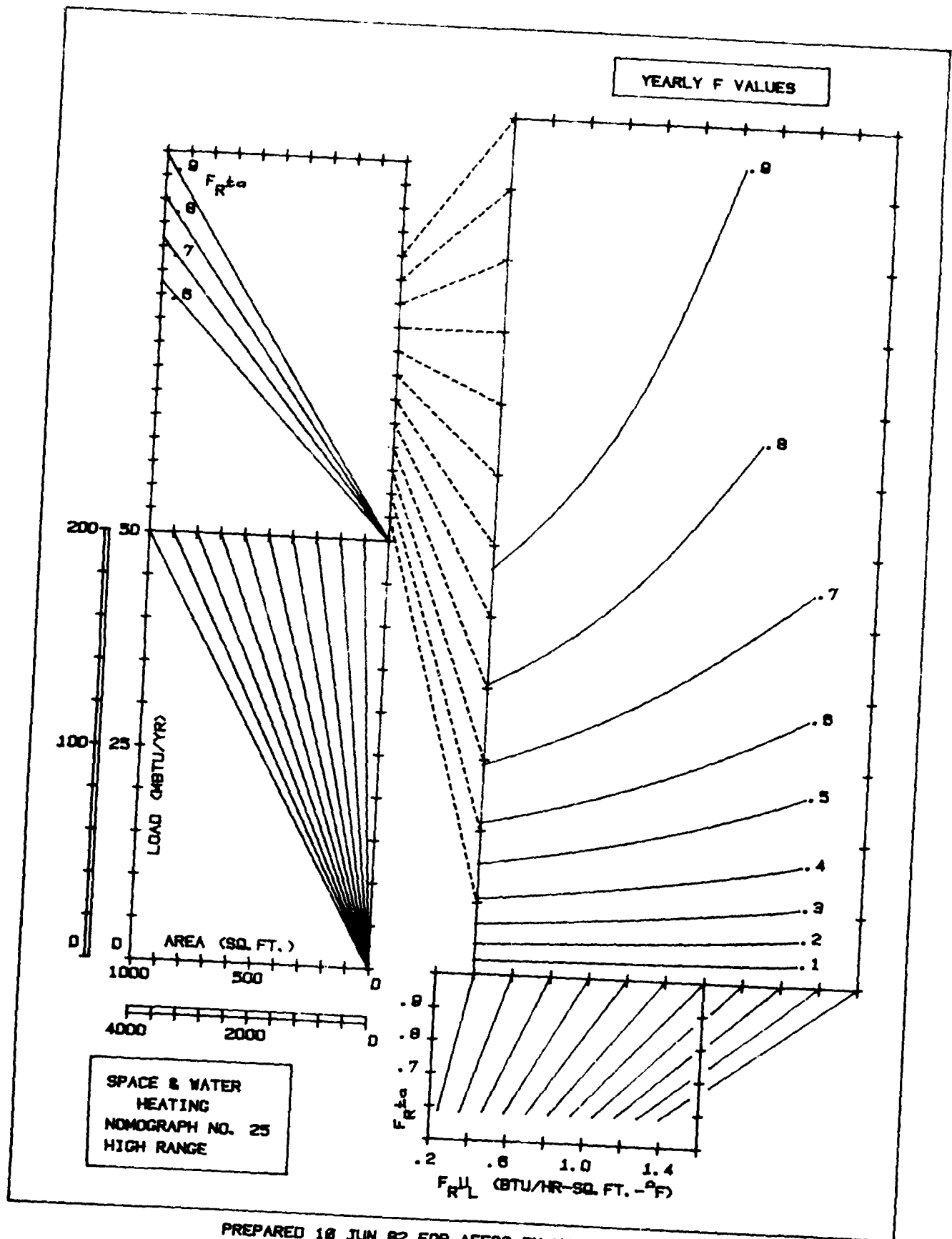
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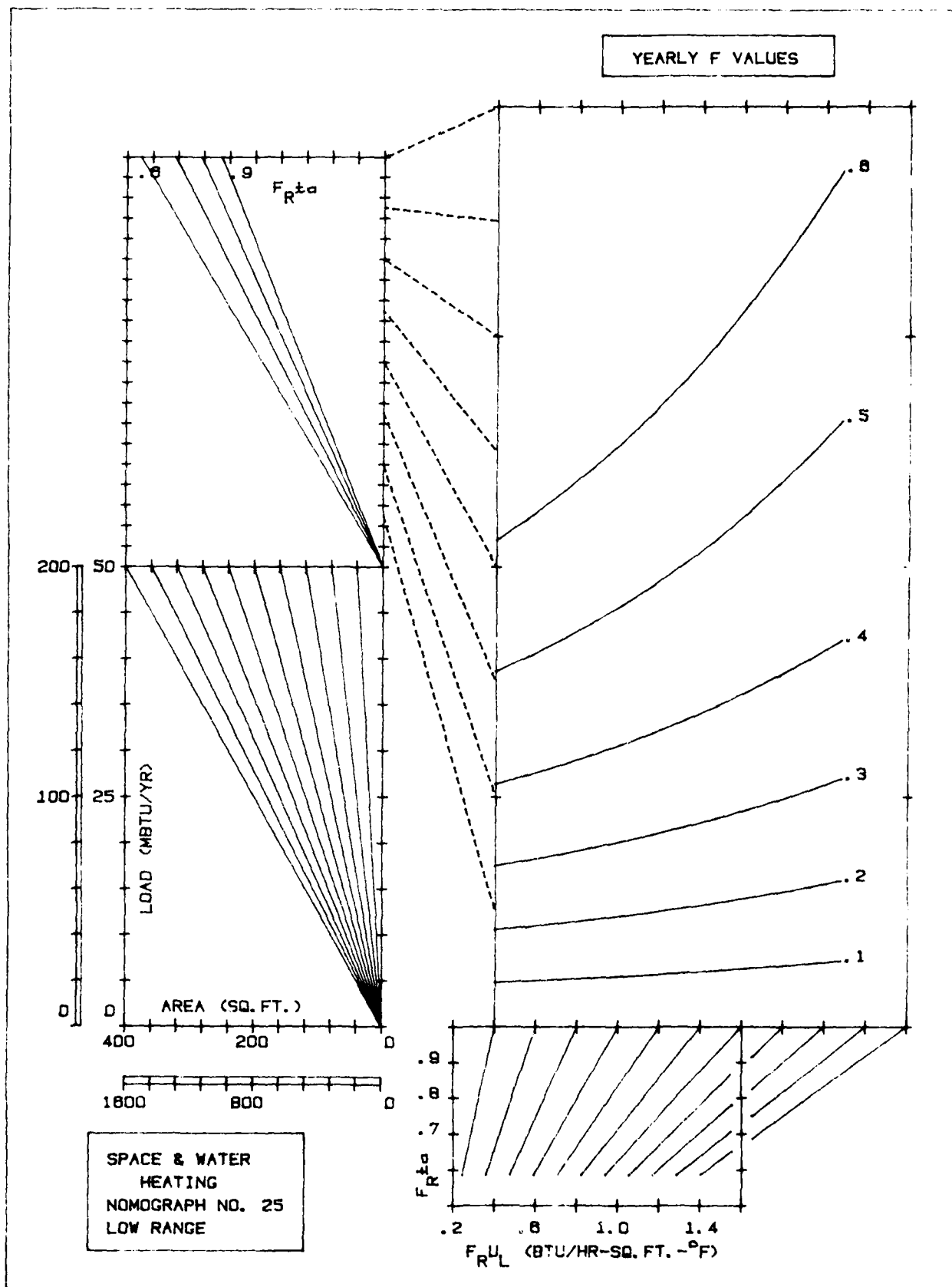


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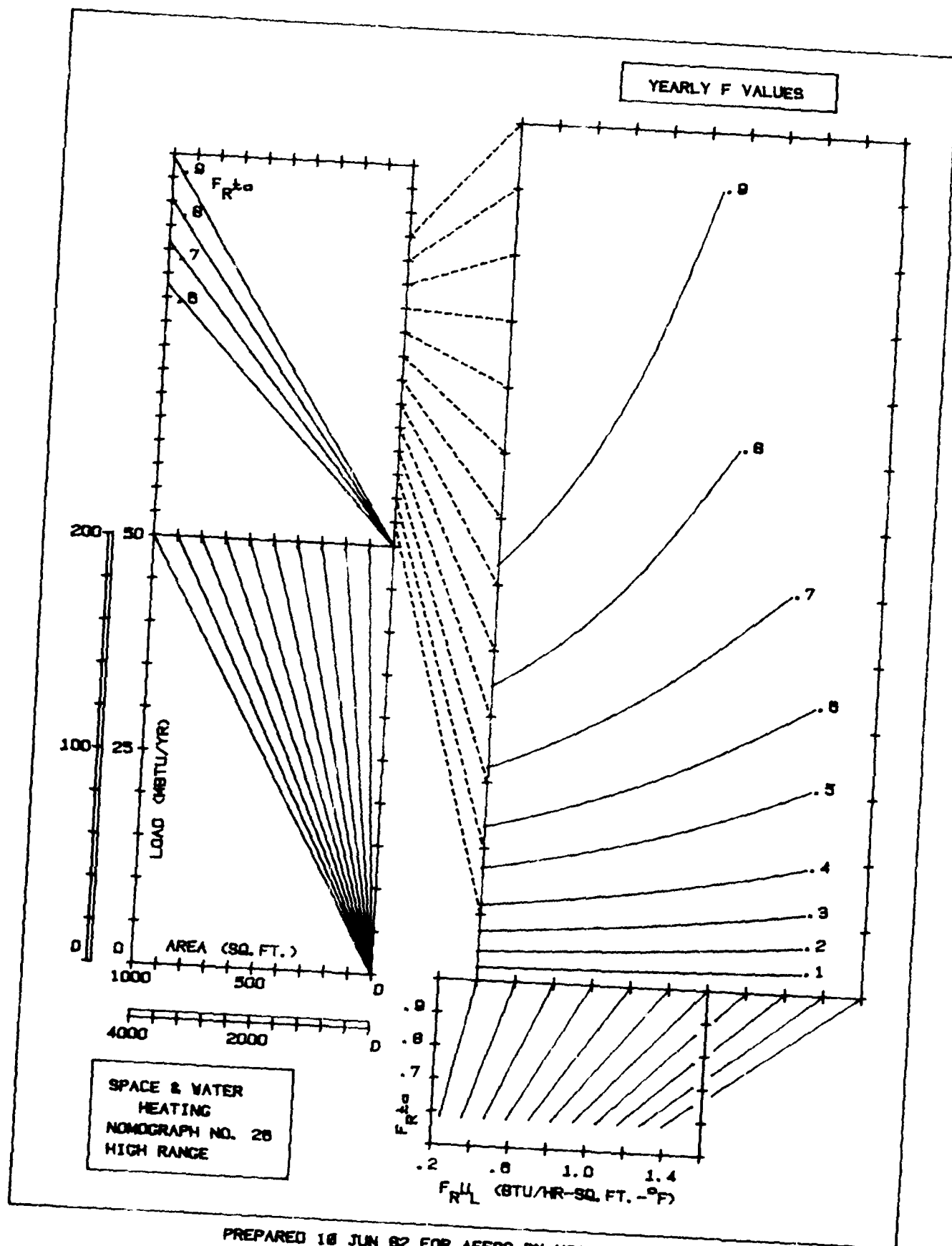


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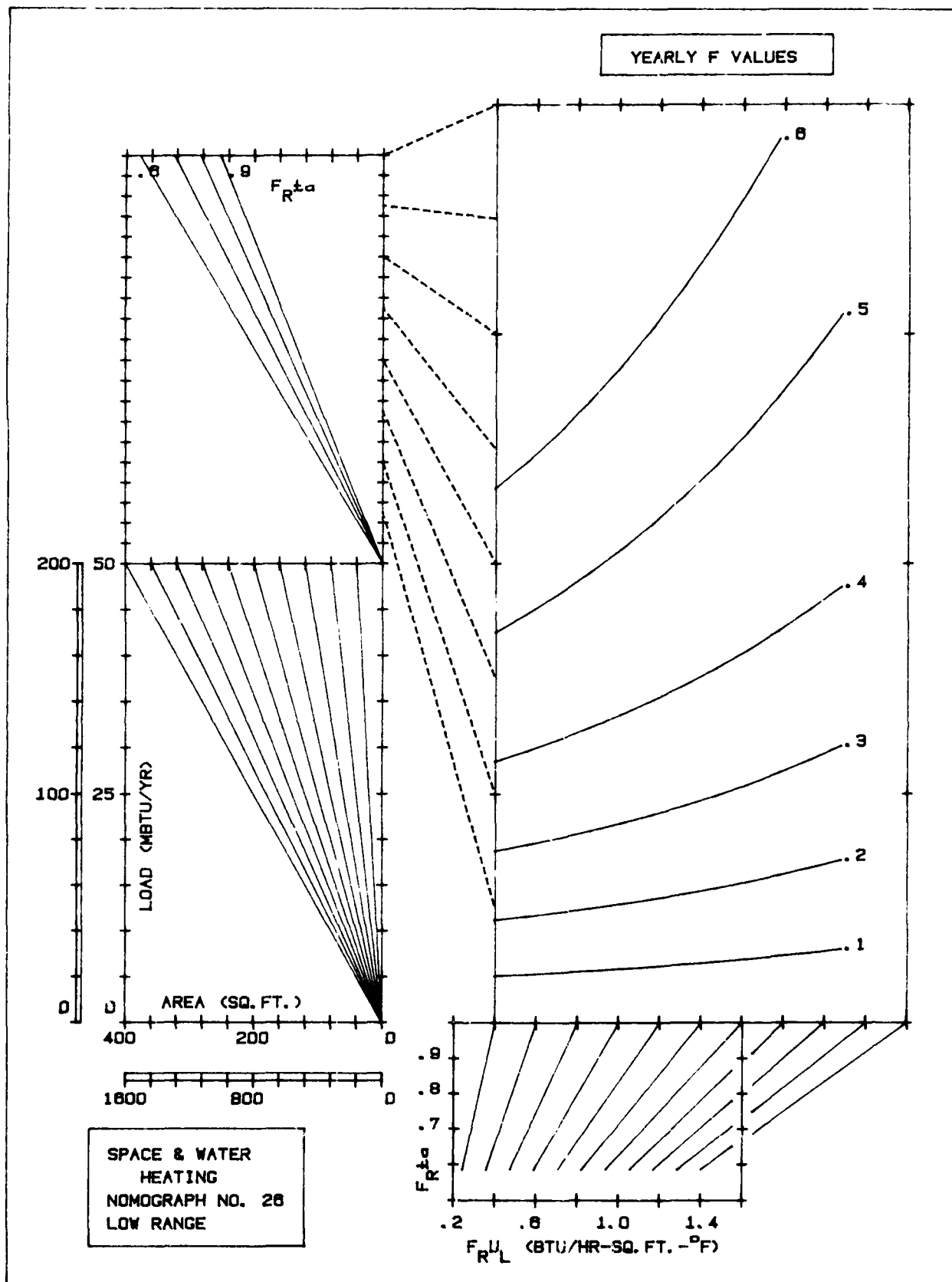




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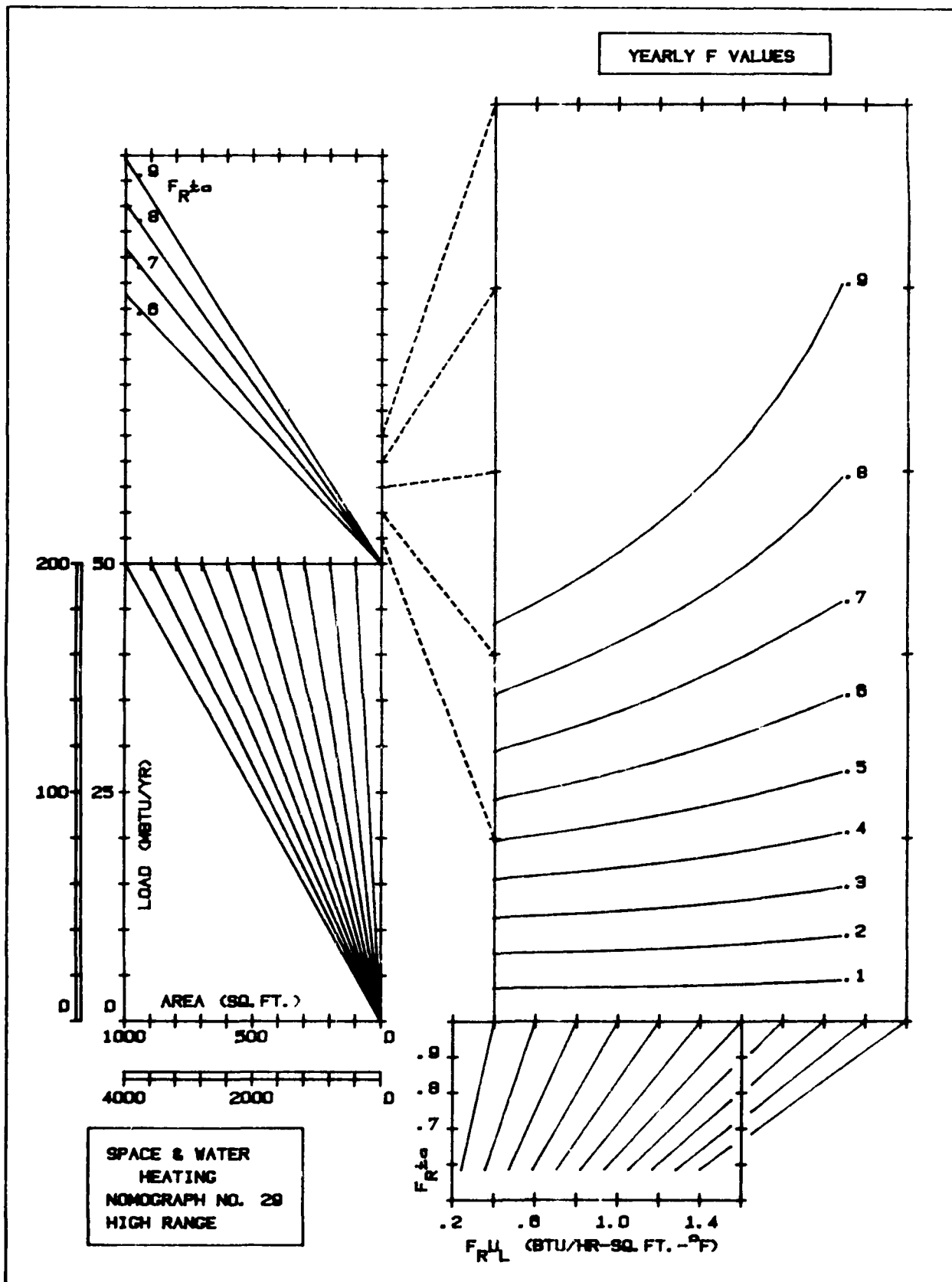
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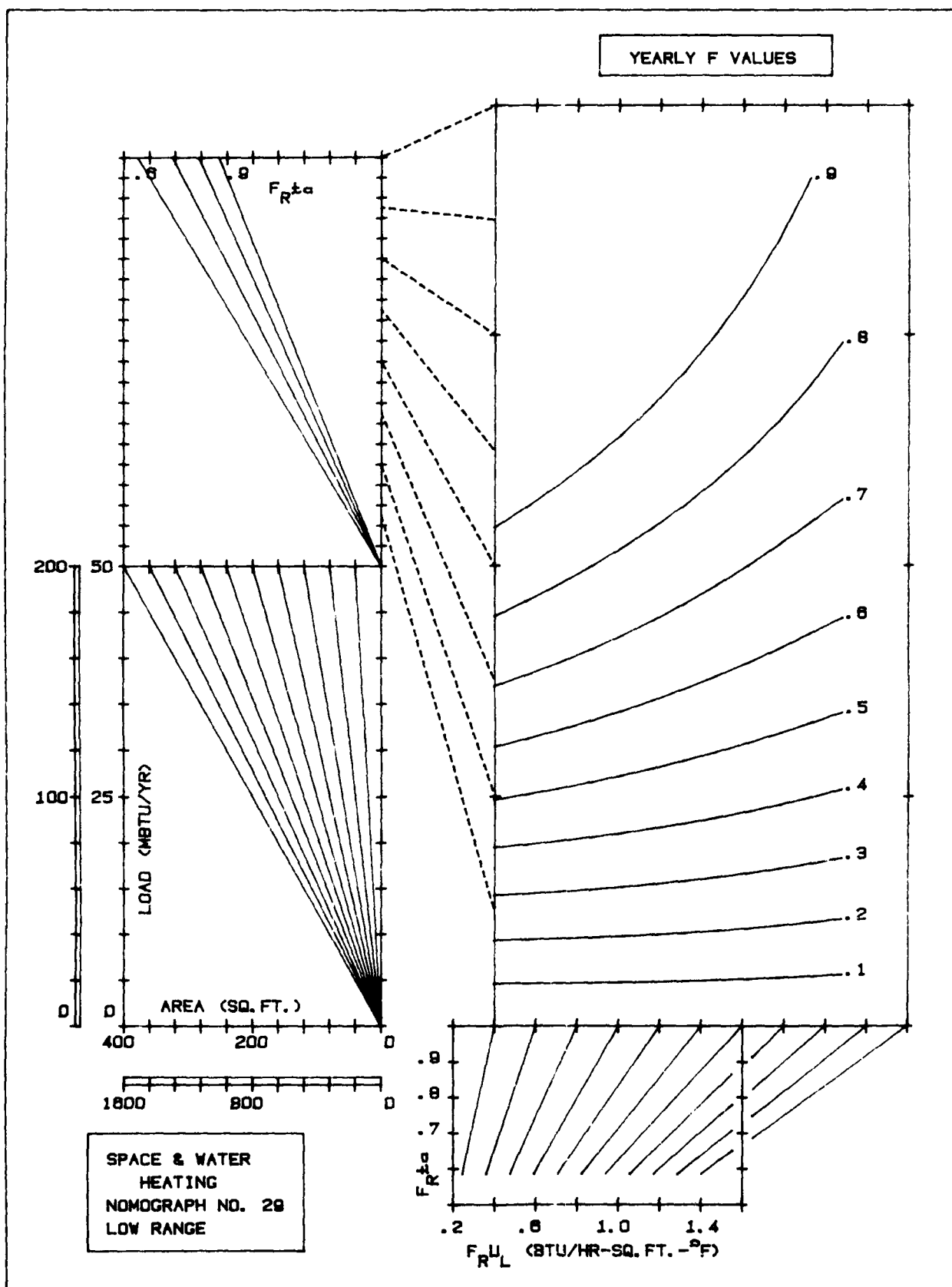
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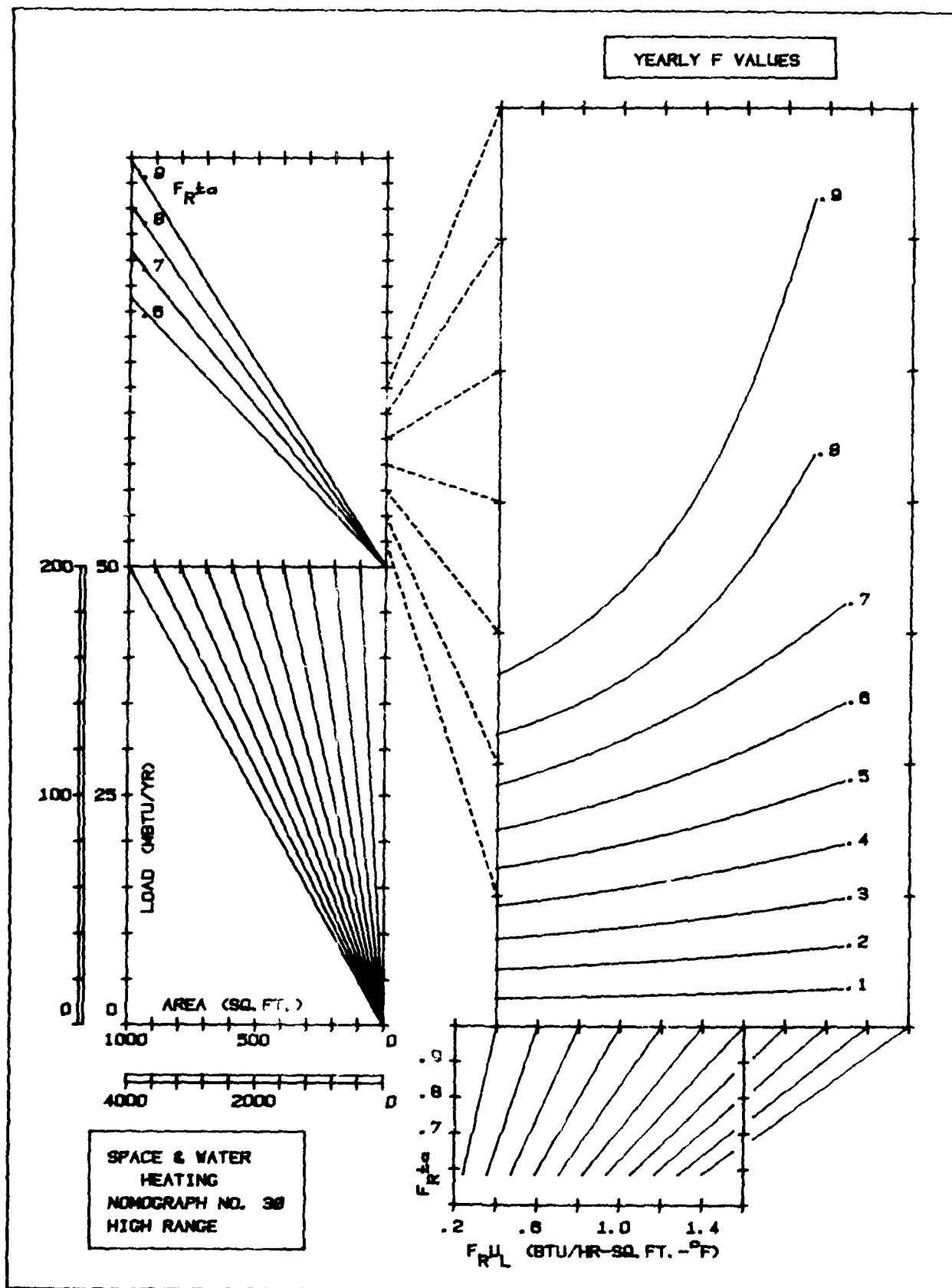




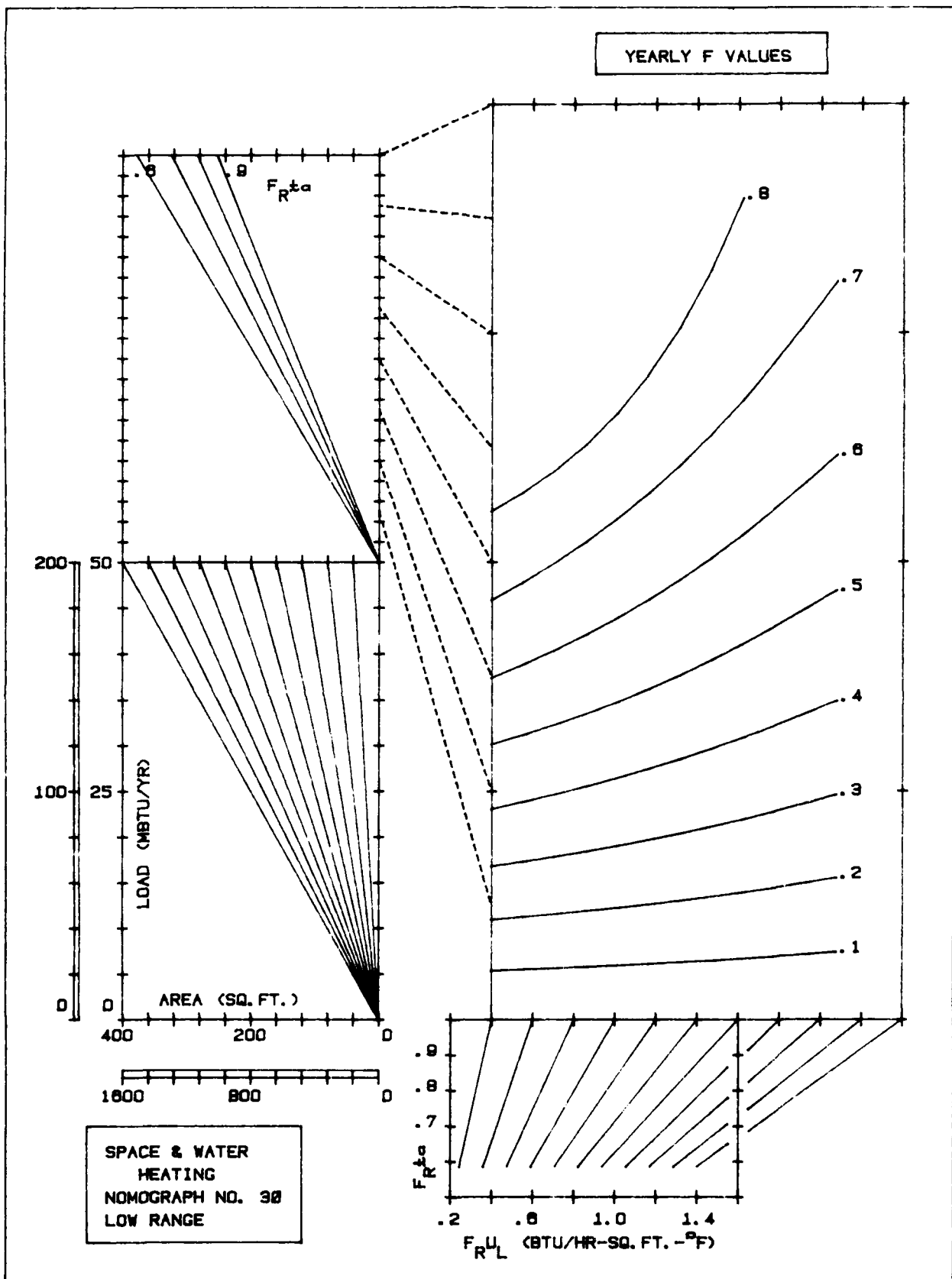
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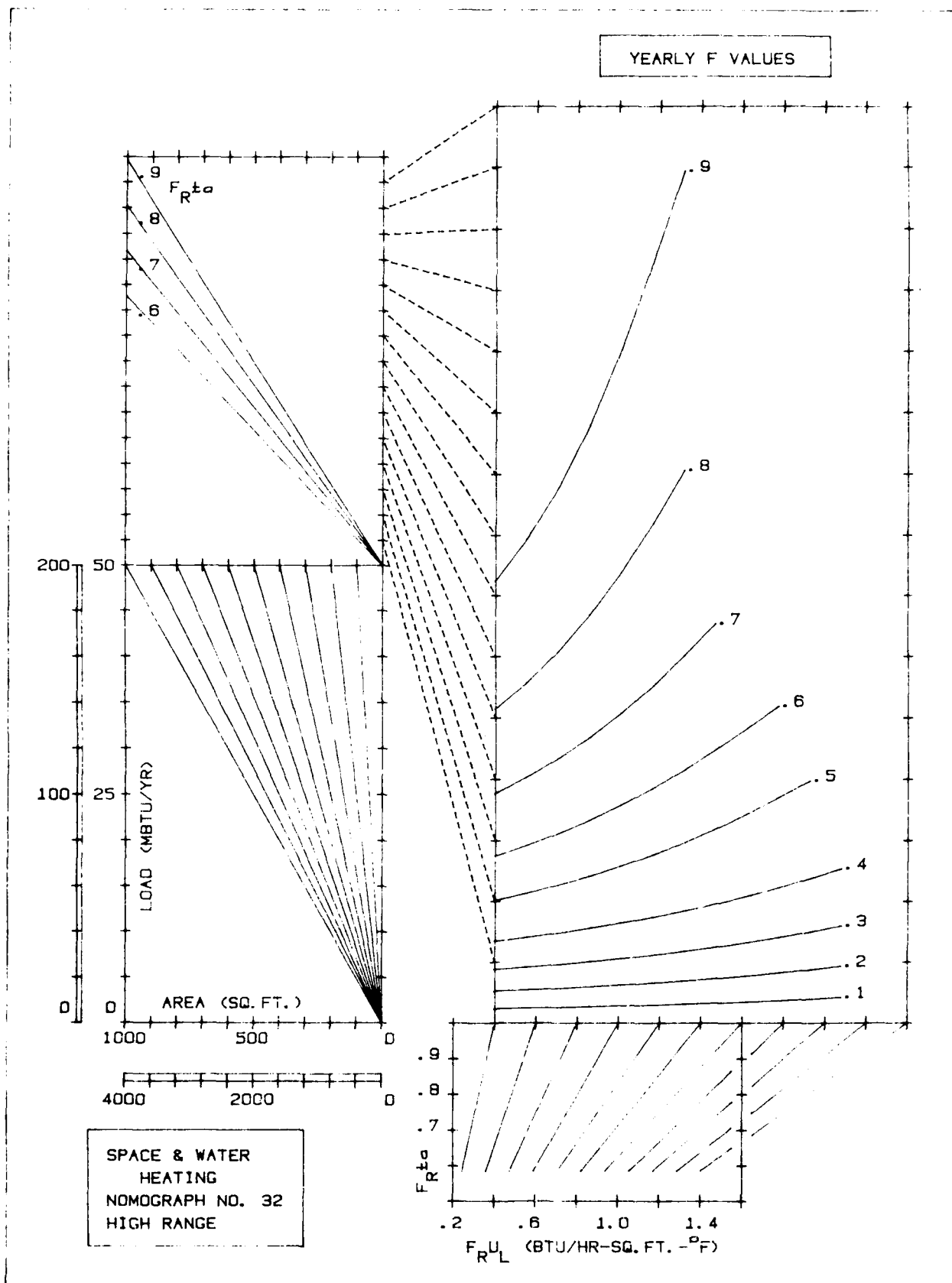
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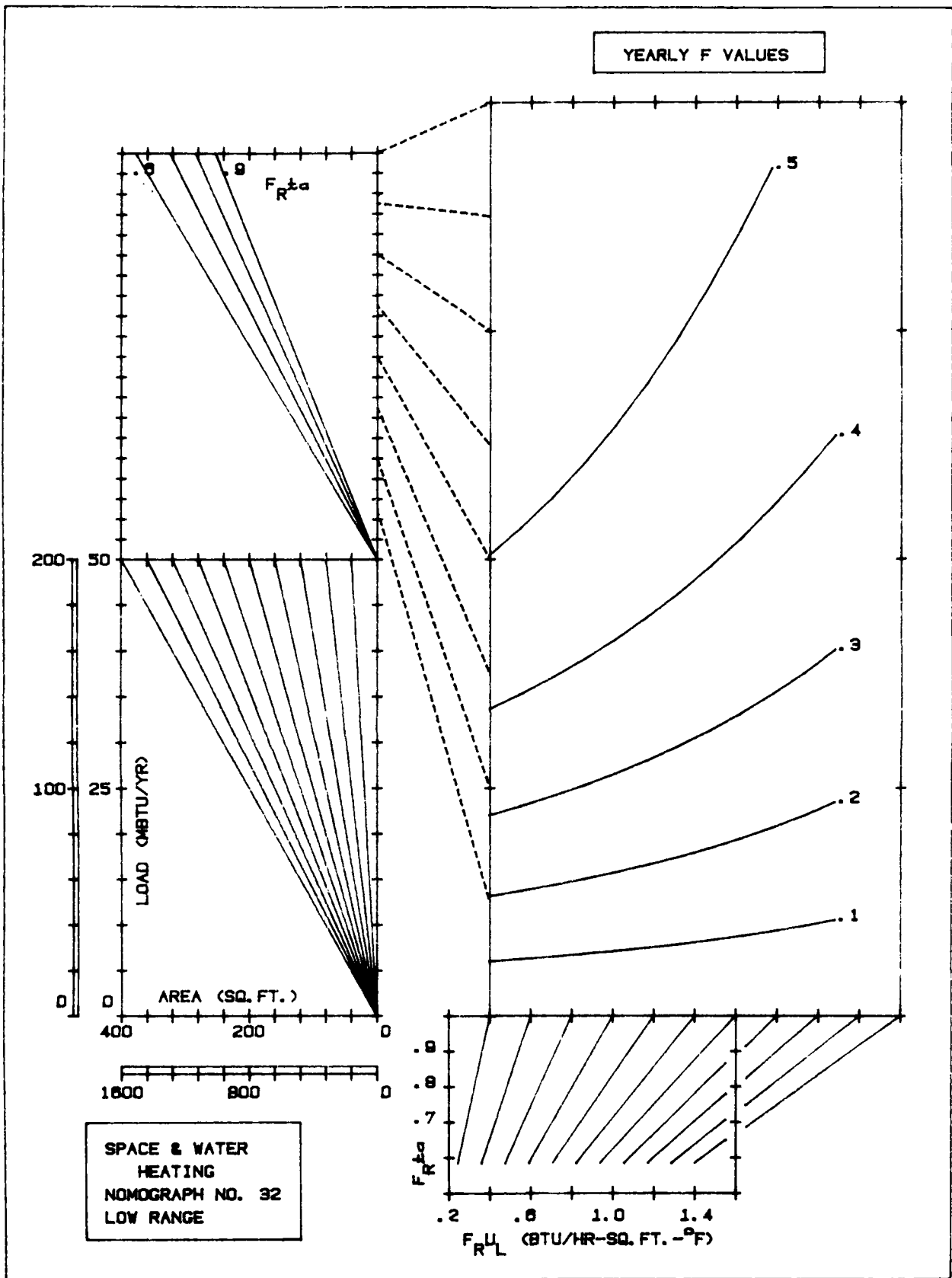
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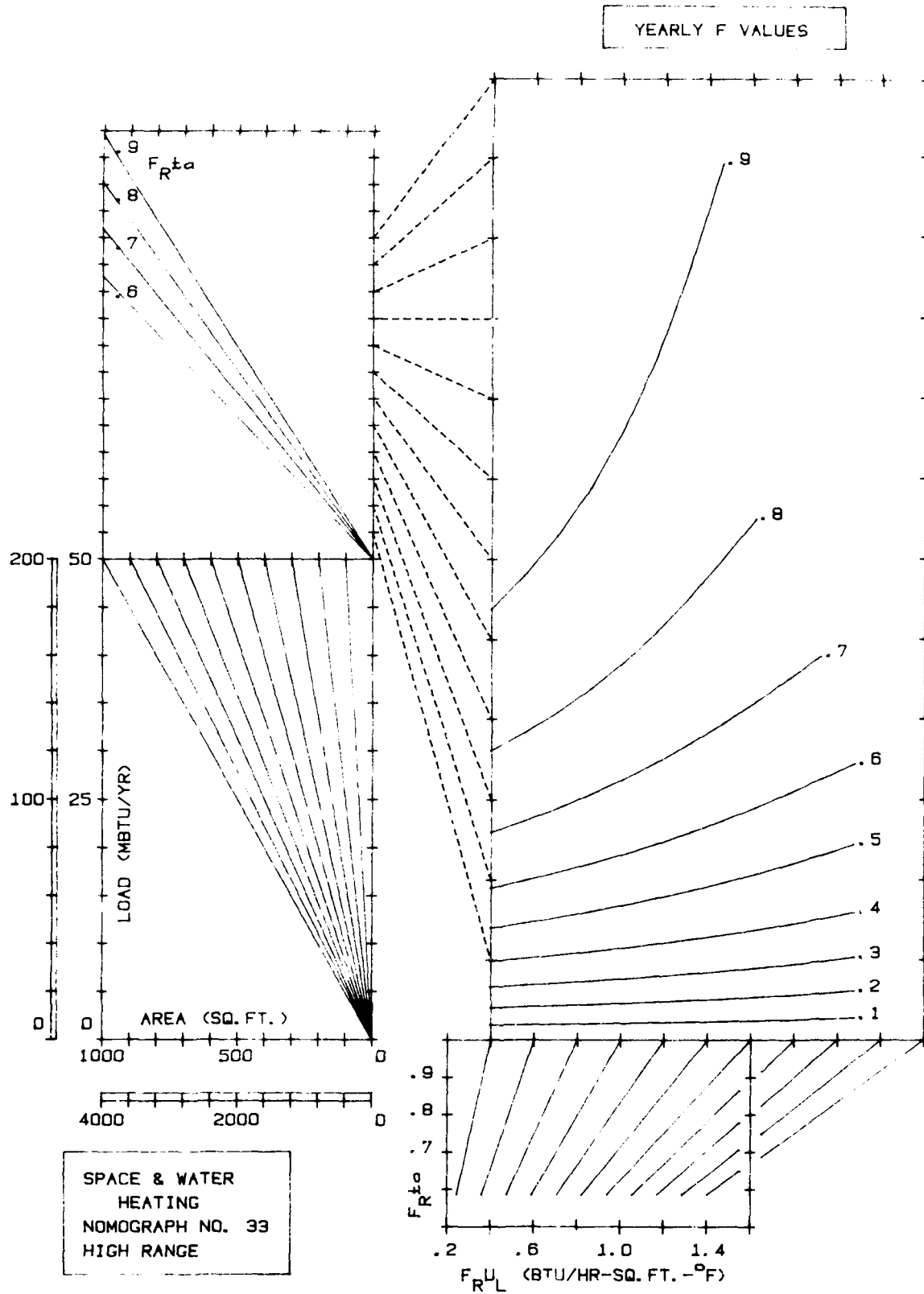
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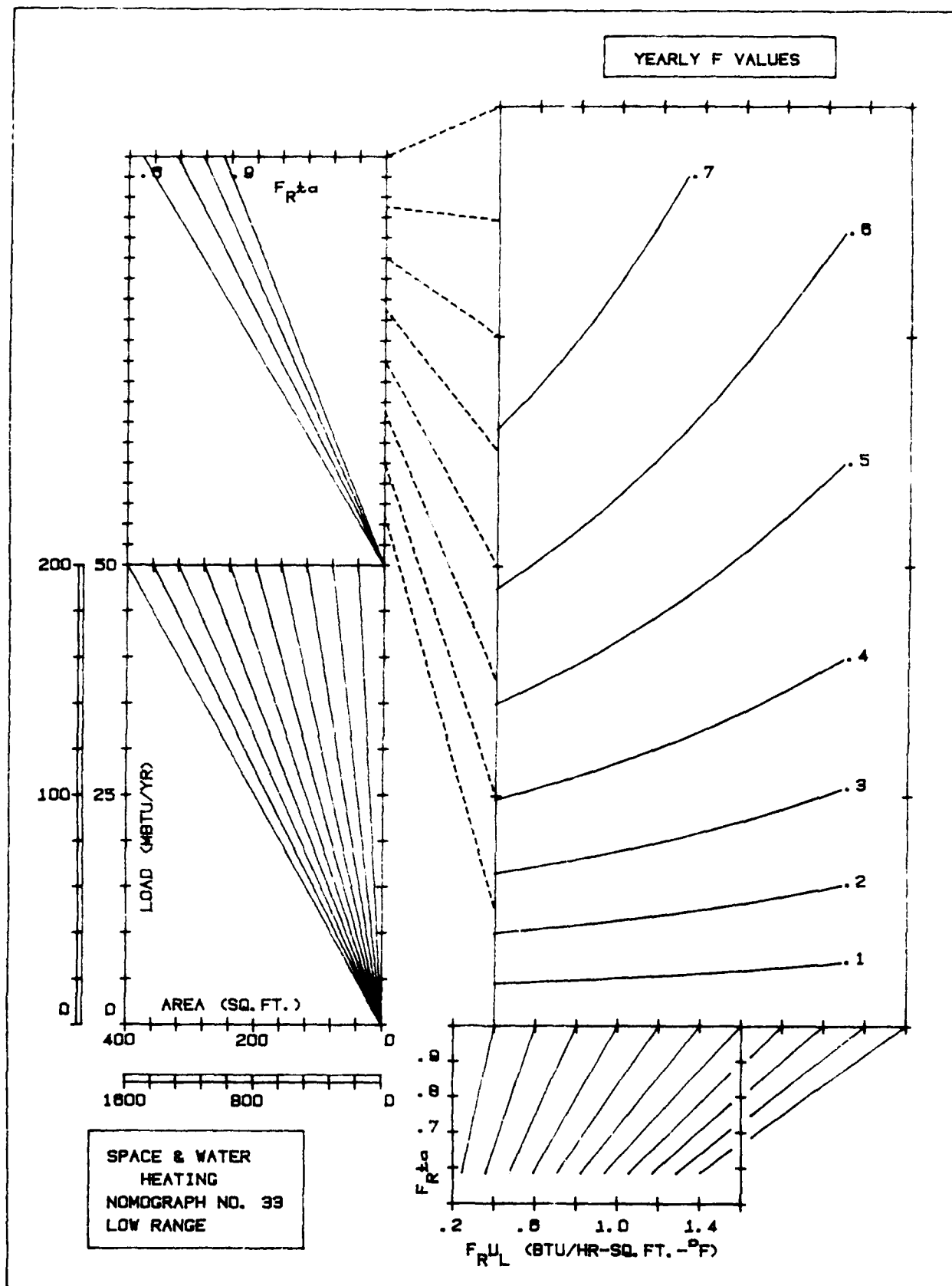
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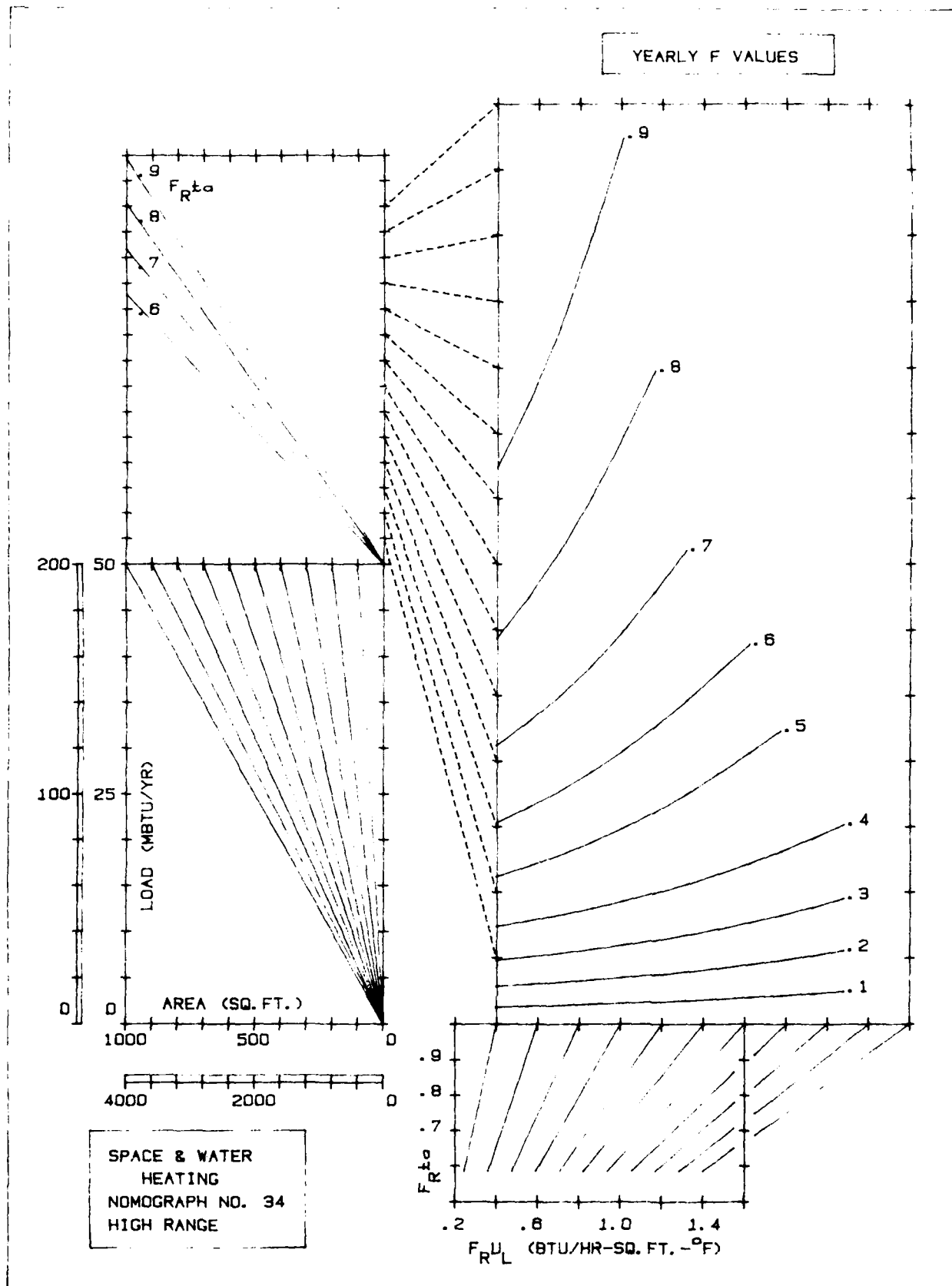


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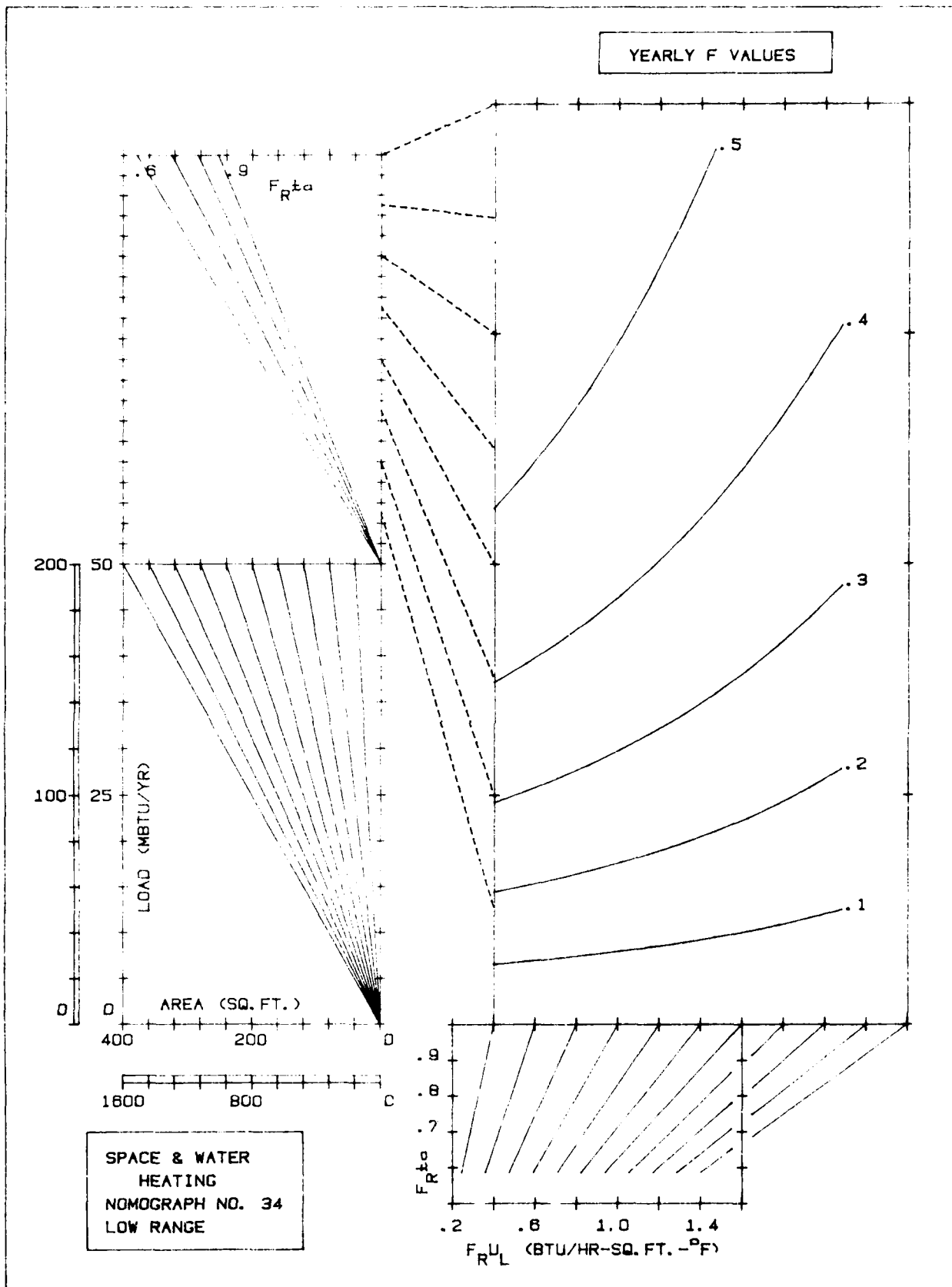


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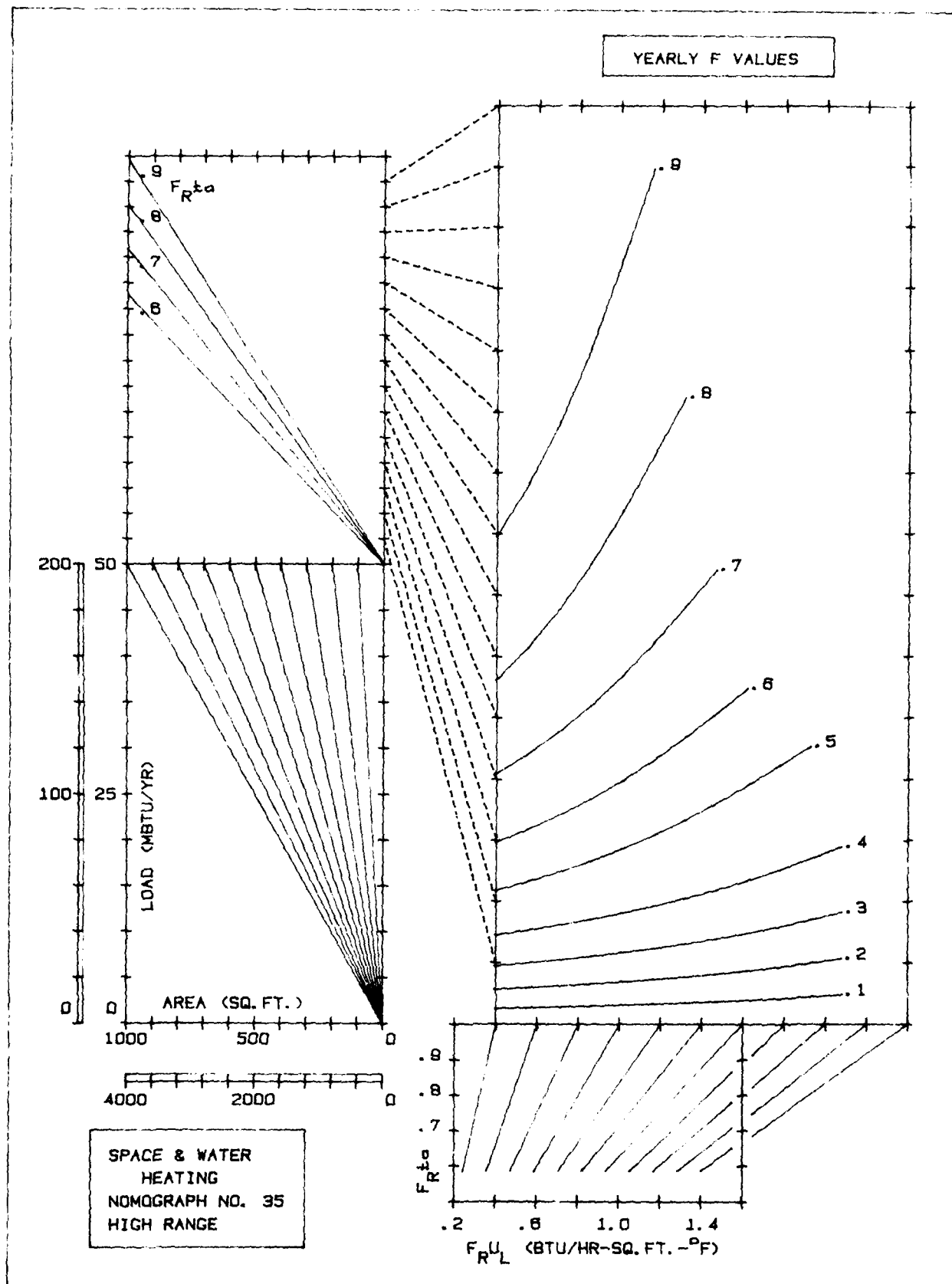




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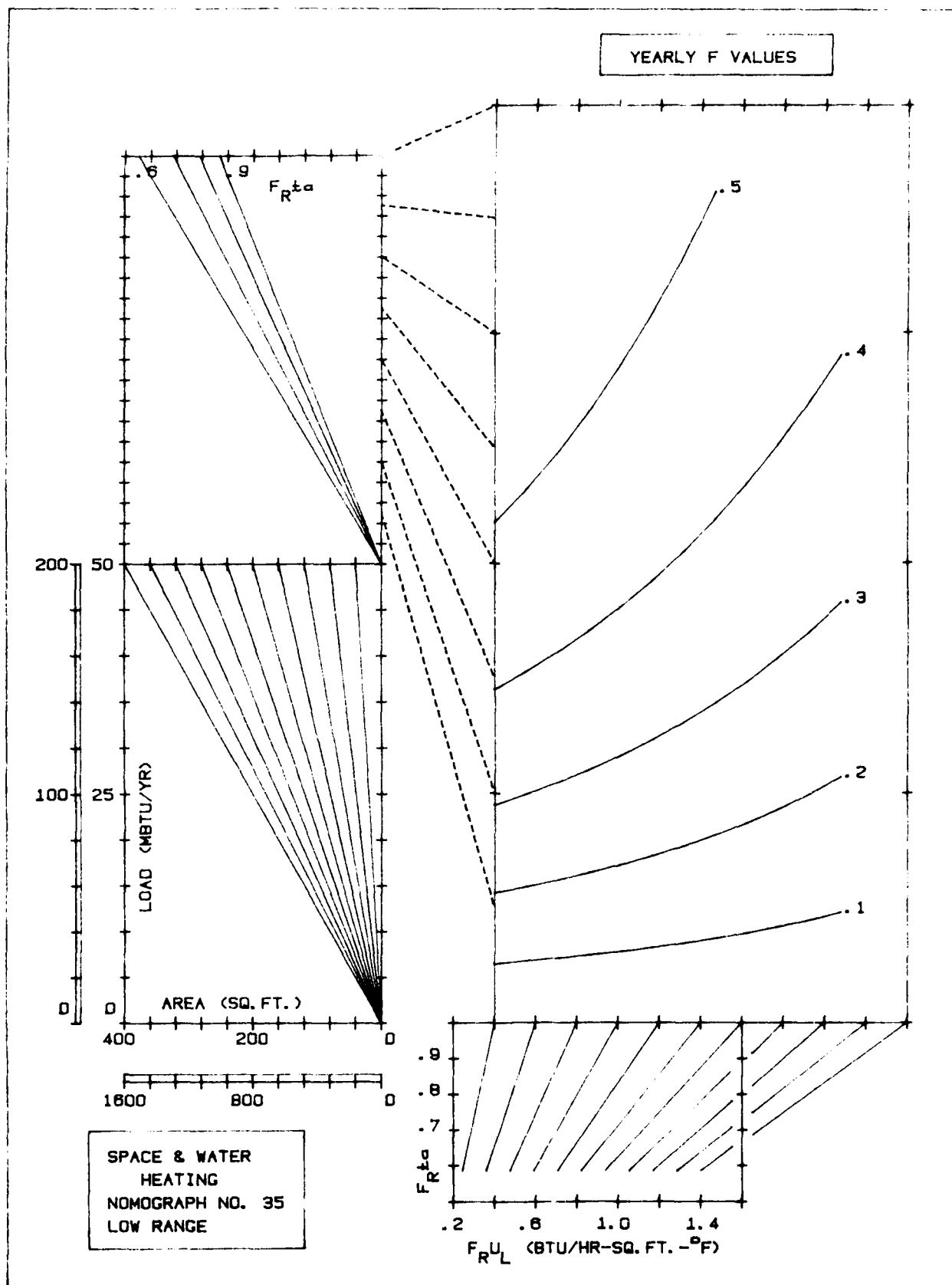


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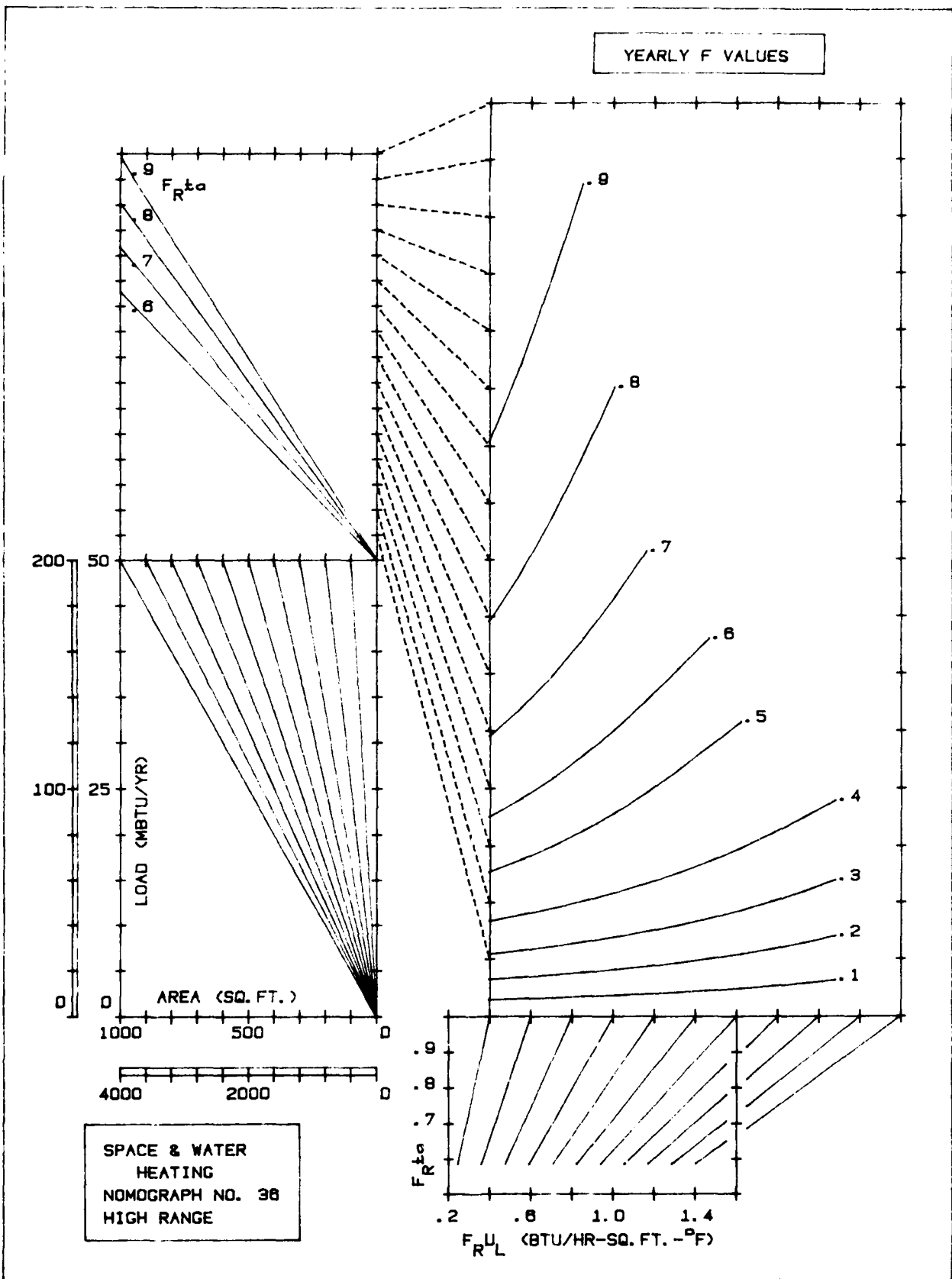
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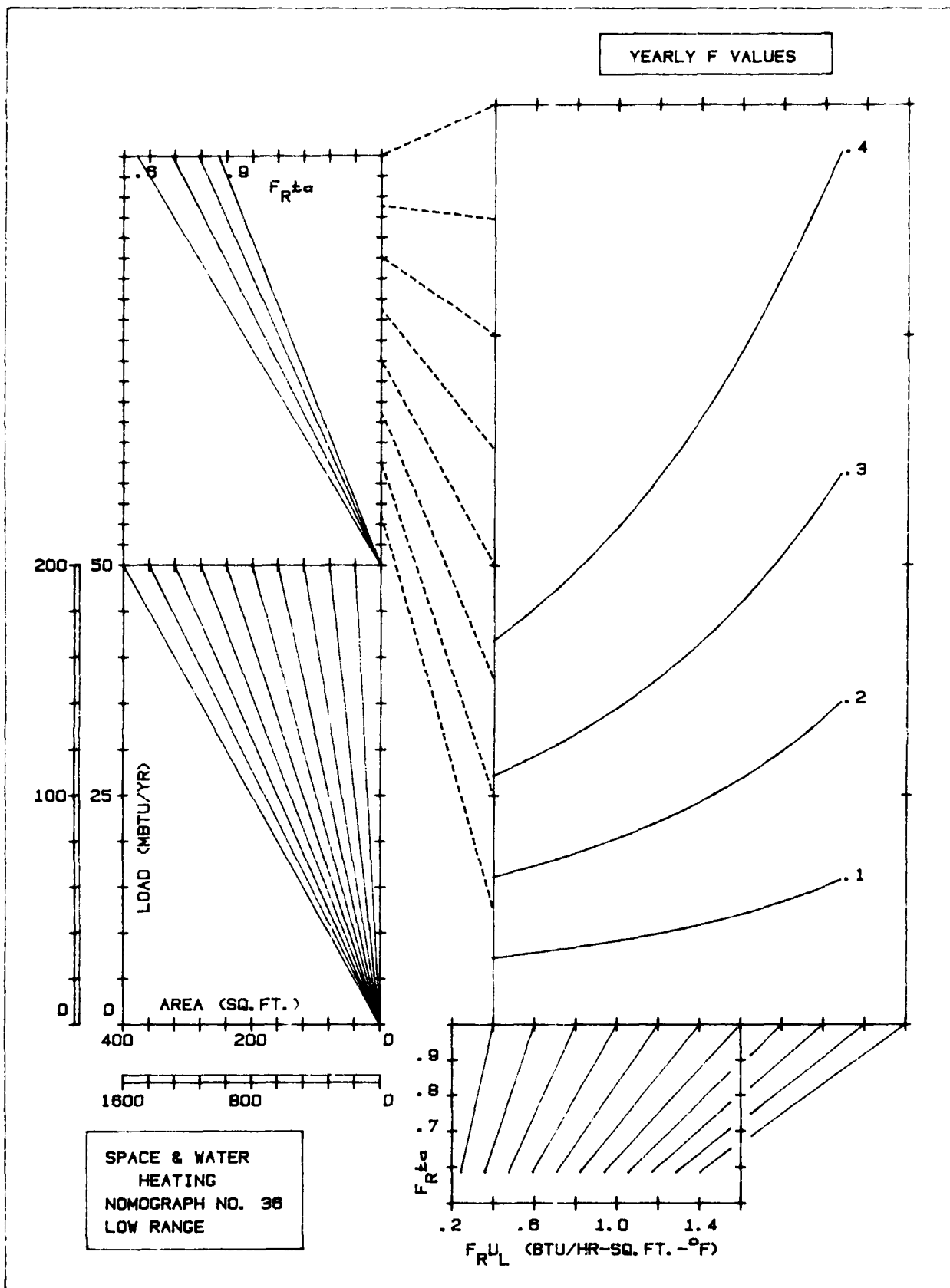


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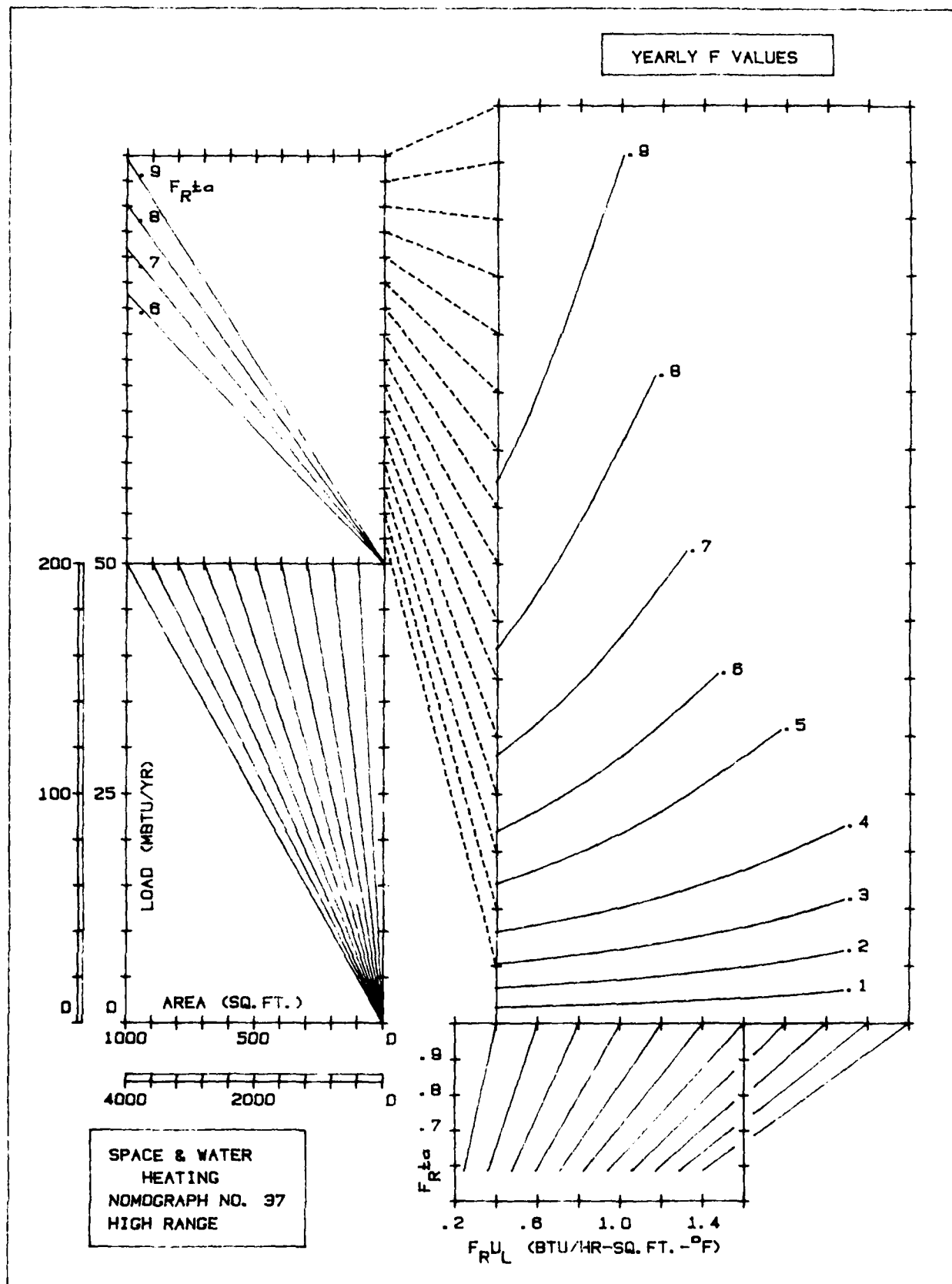
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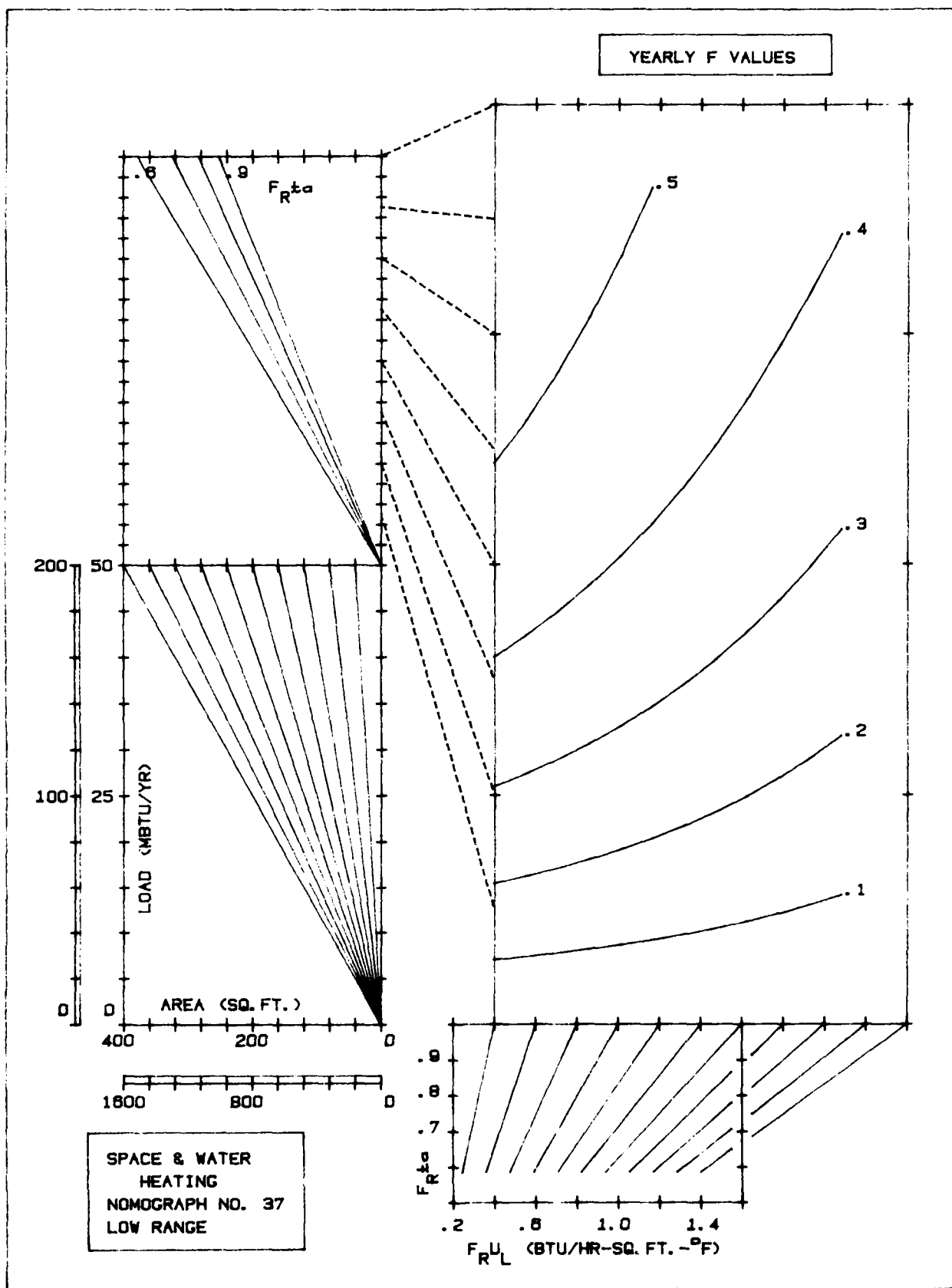
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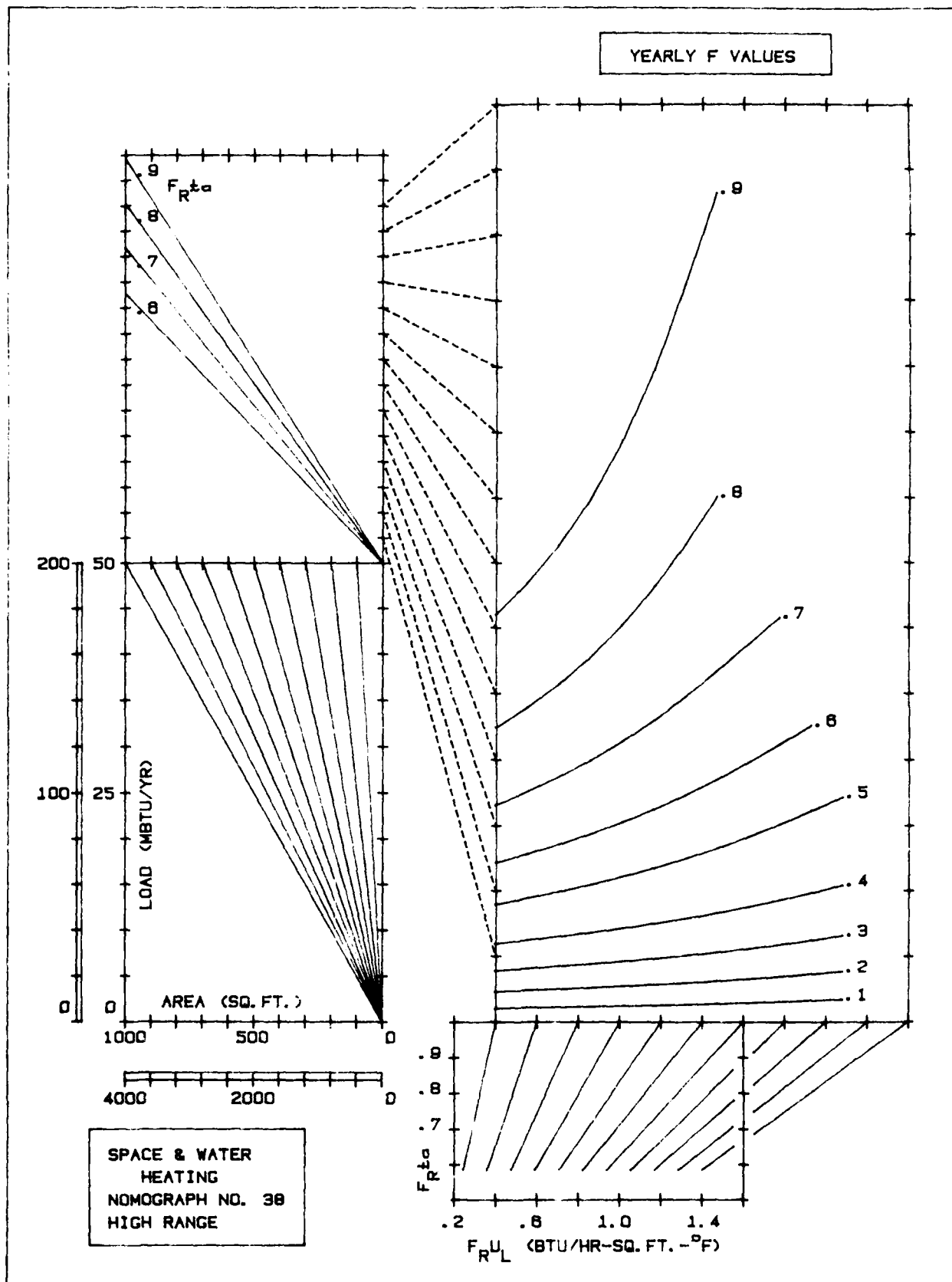
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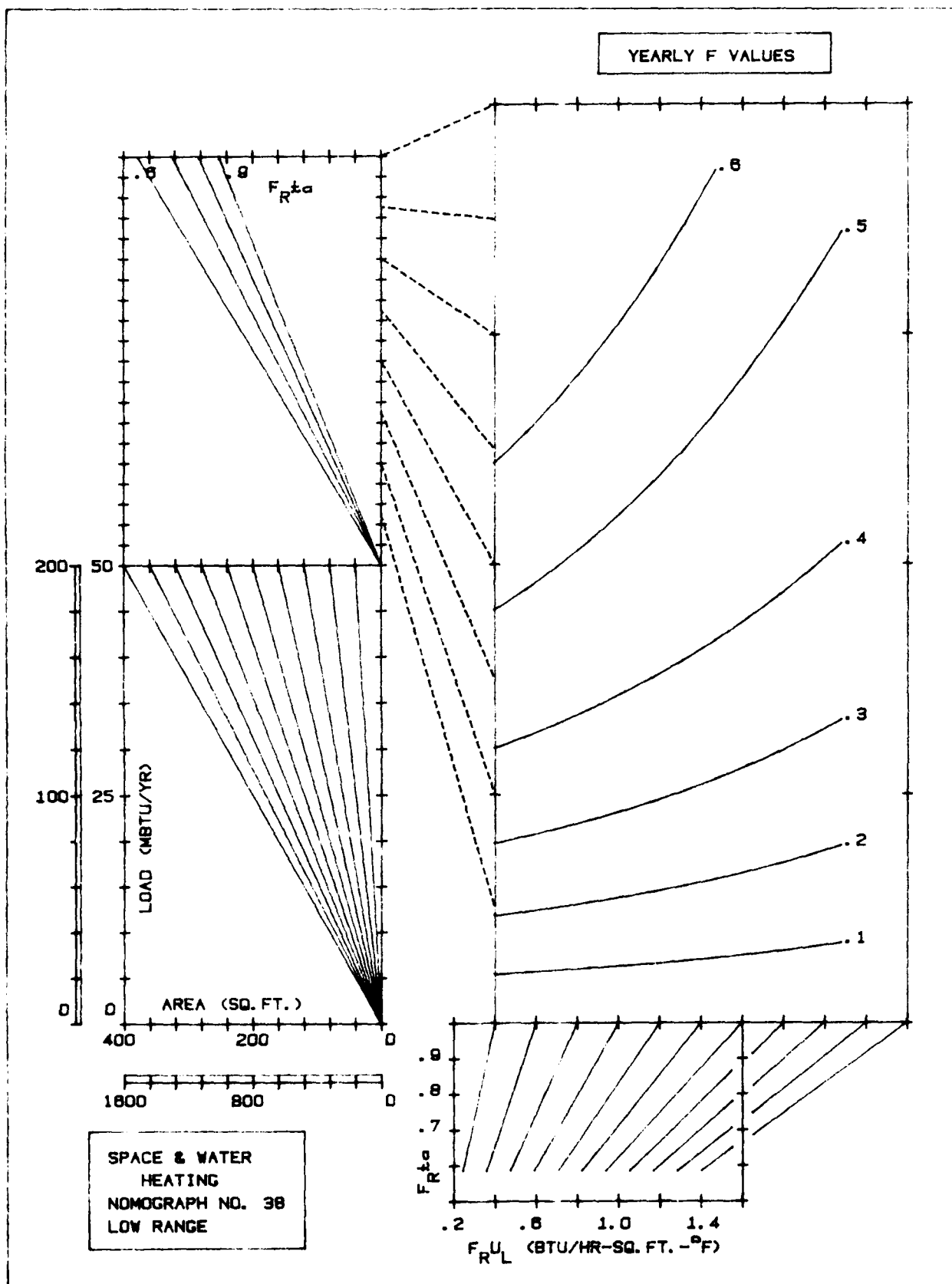
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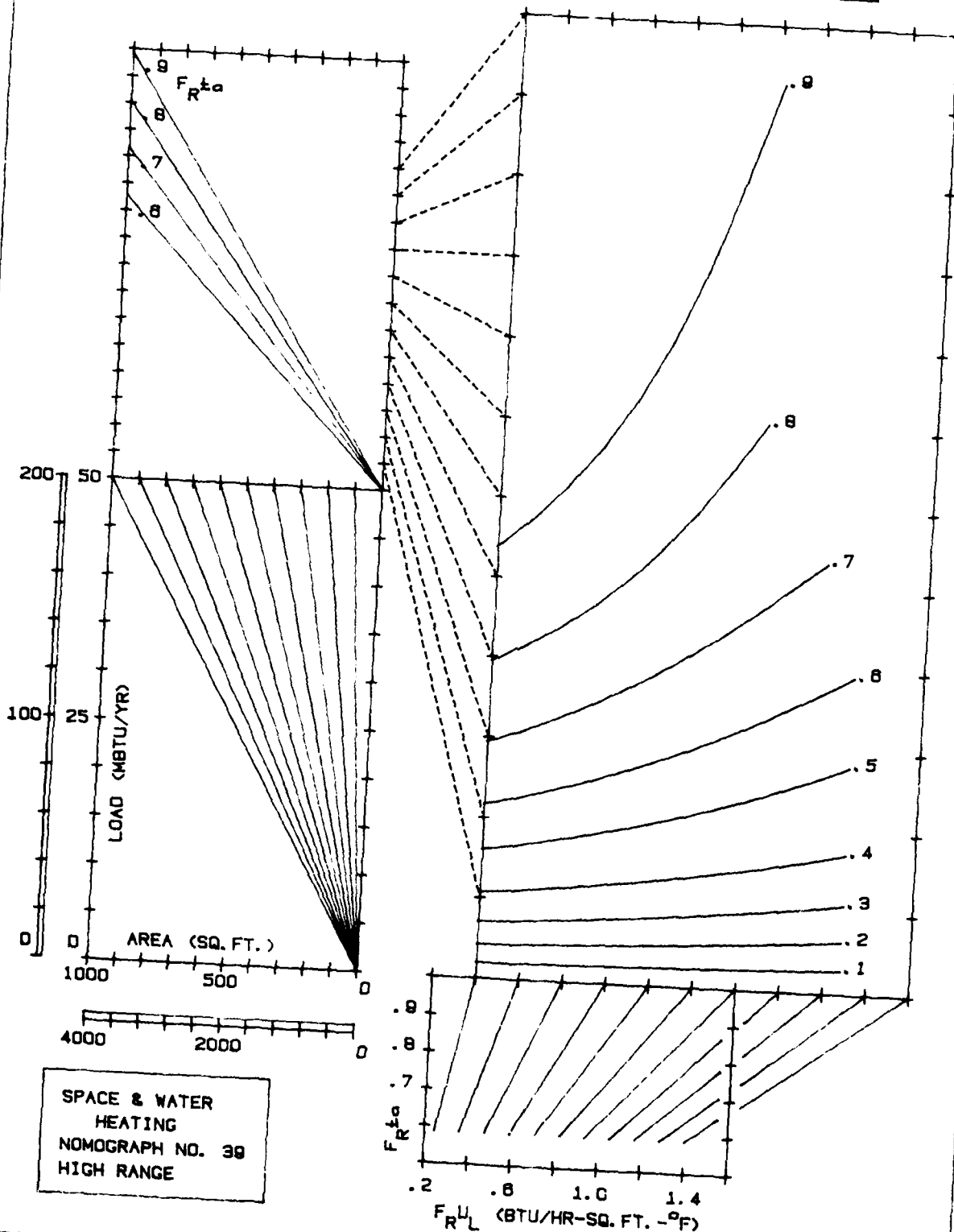


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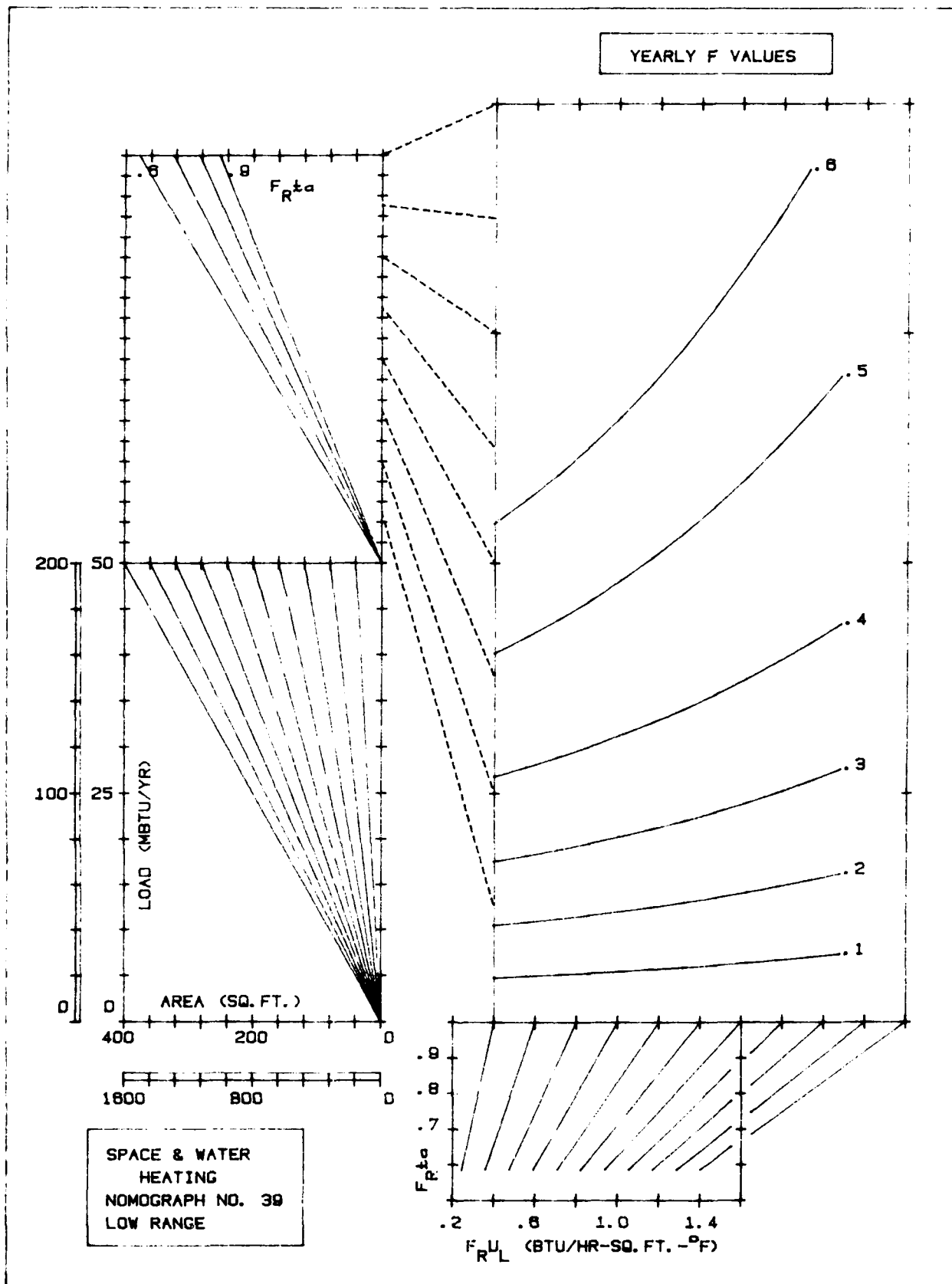
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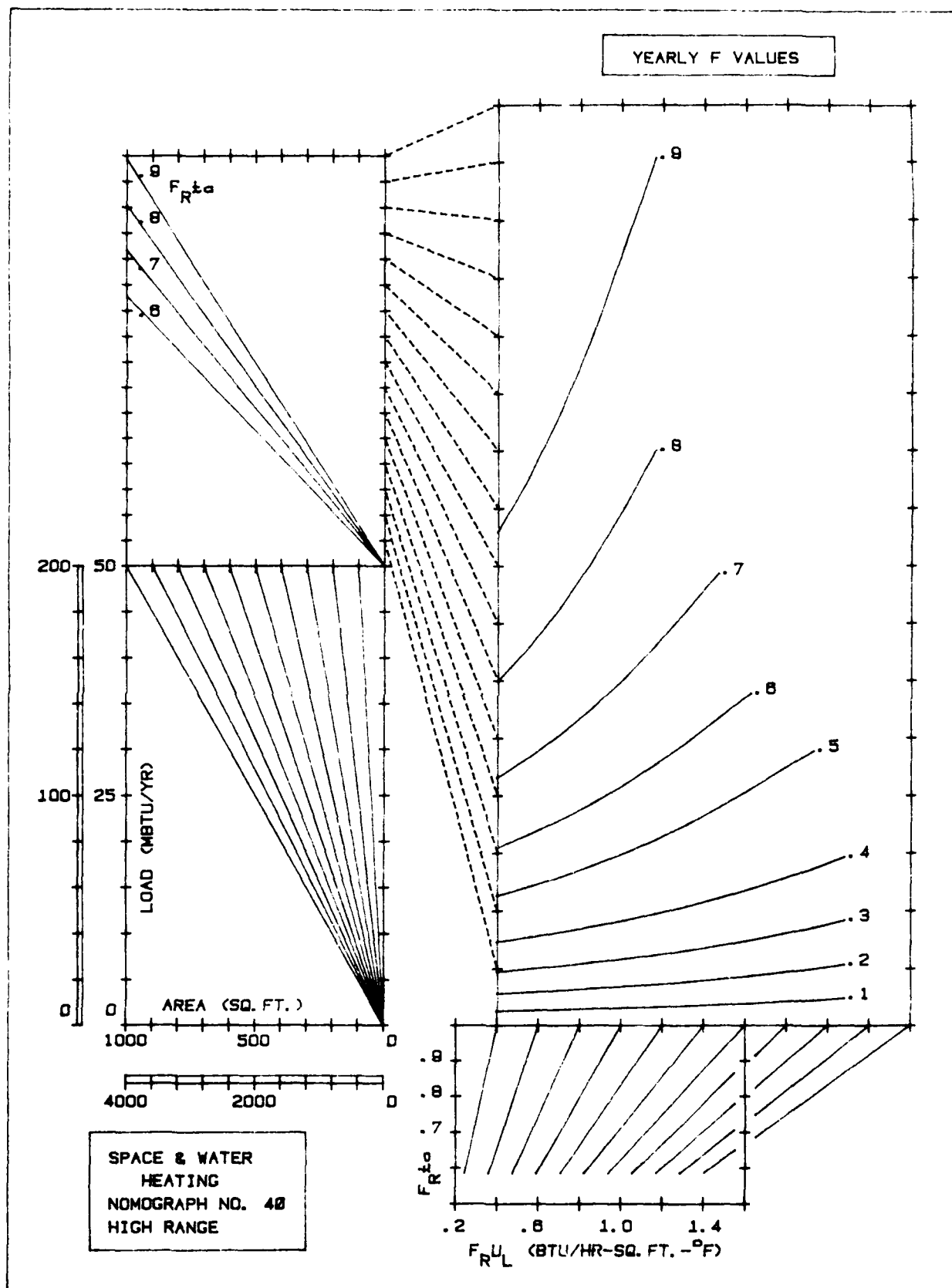


SPACE & WATER  
HEATING  
NOMOGRAPH NO. 39  
HIGH RANGE

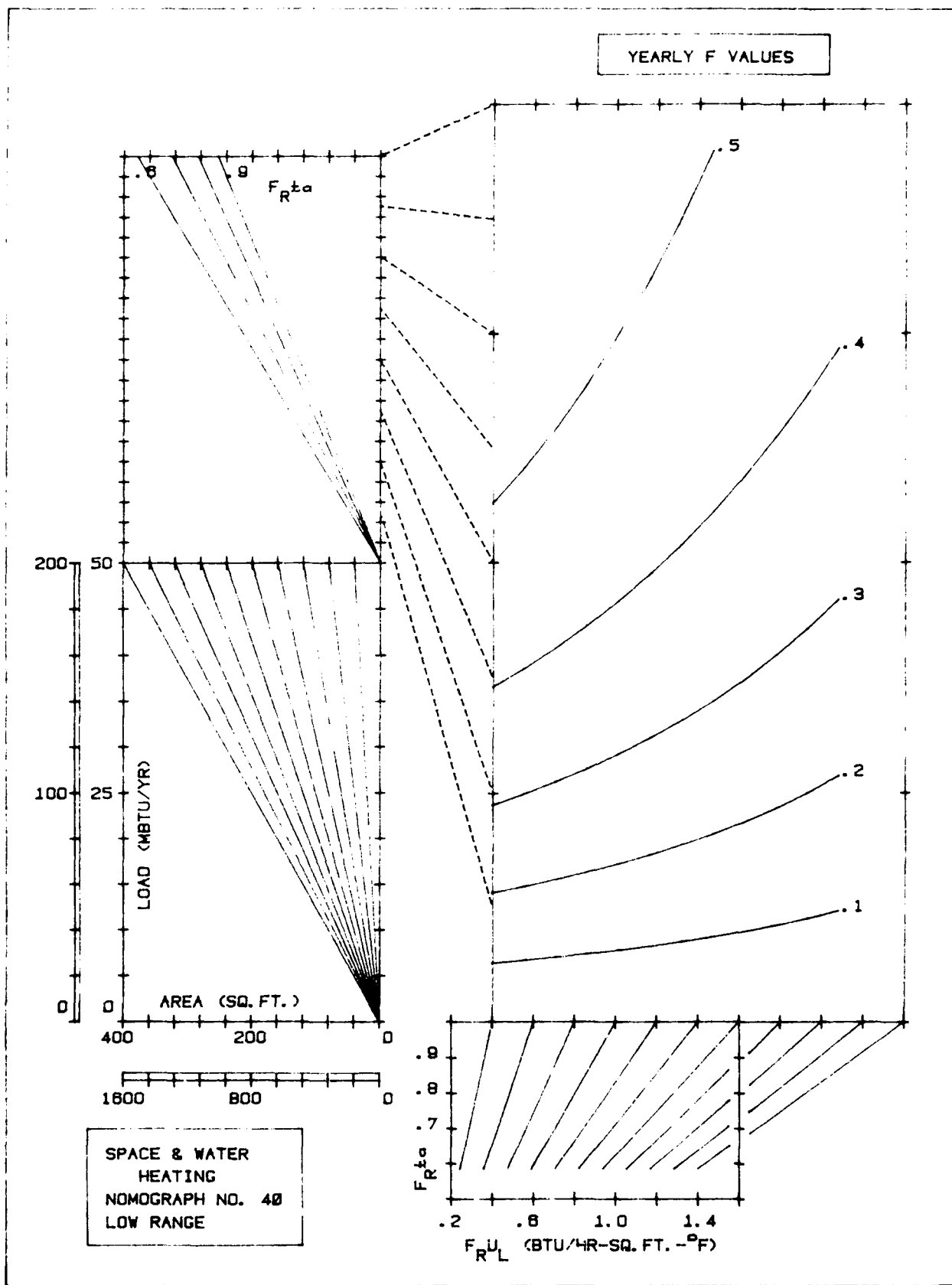
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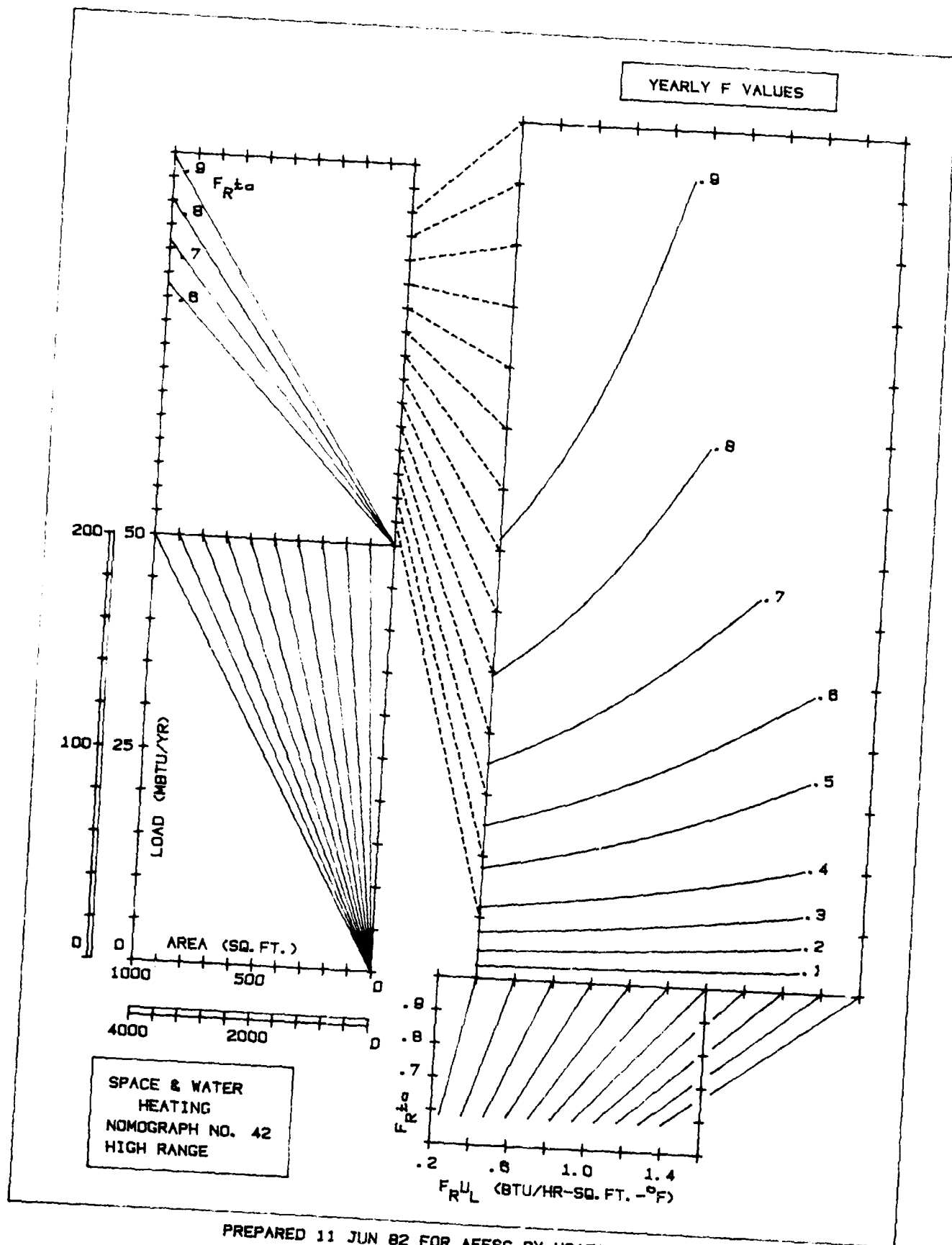
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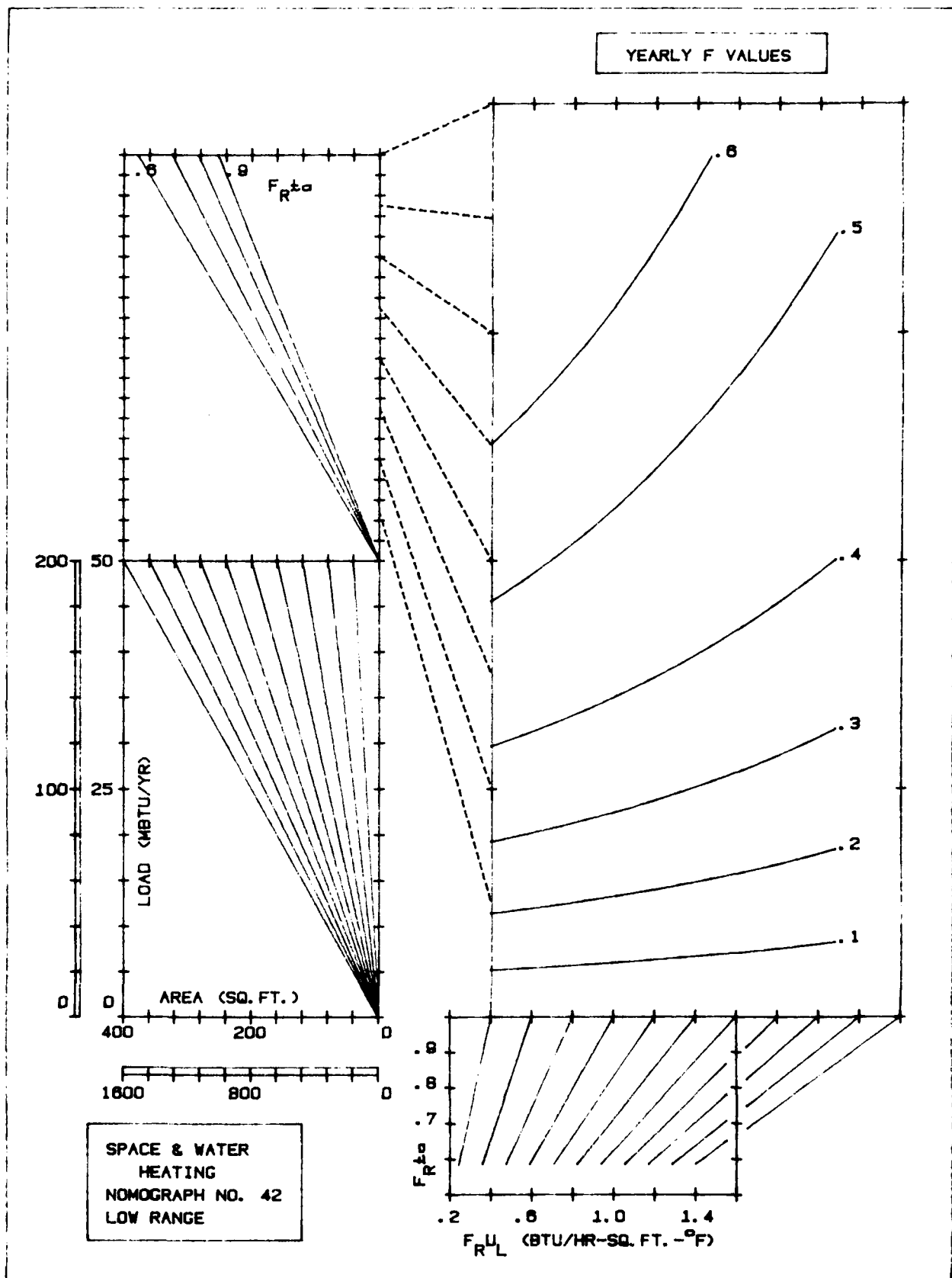


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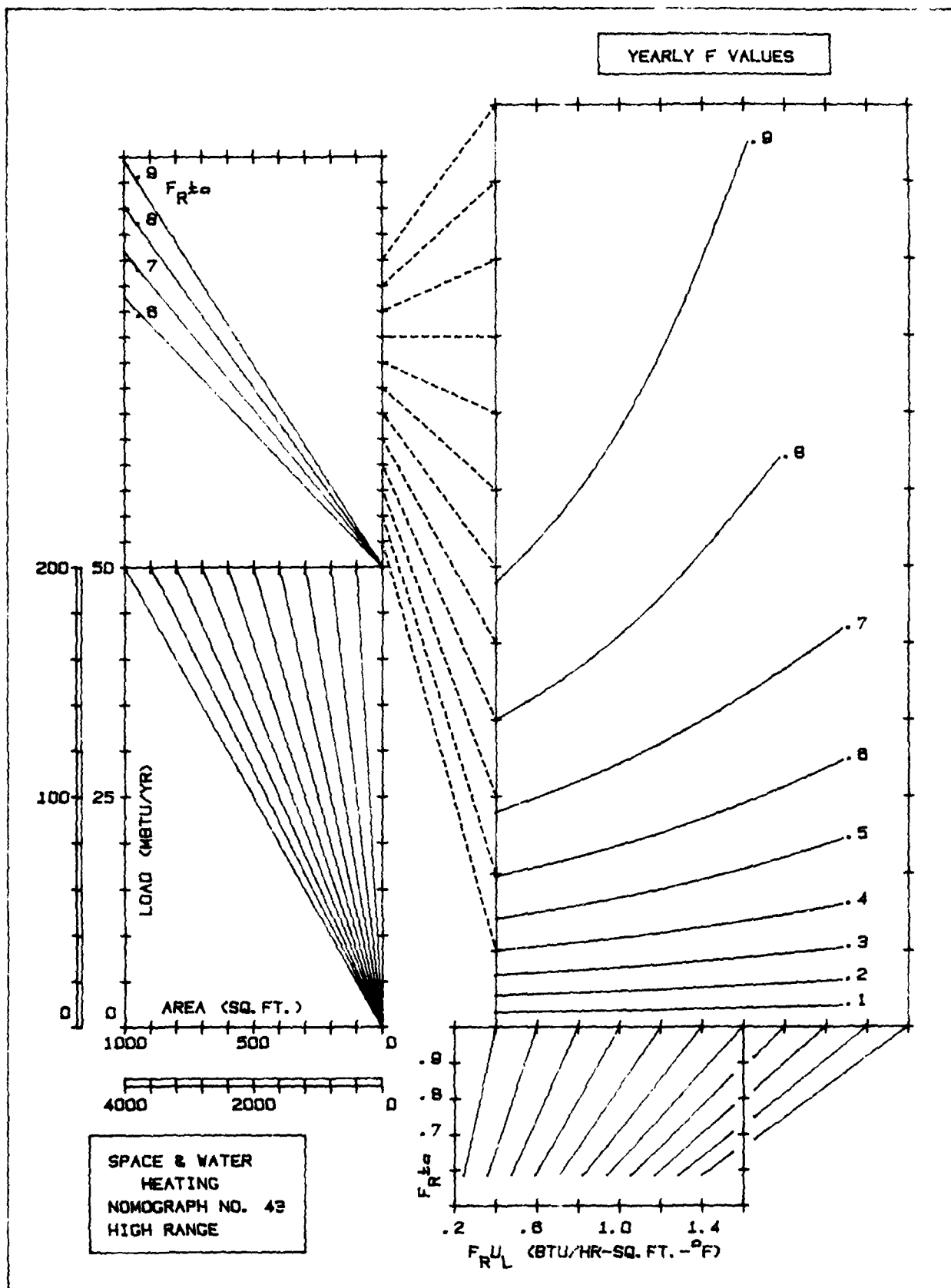
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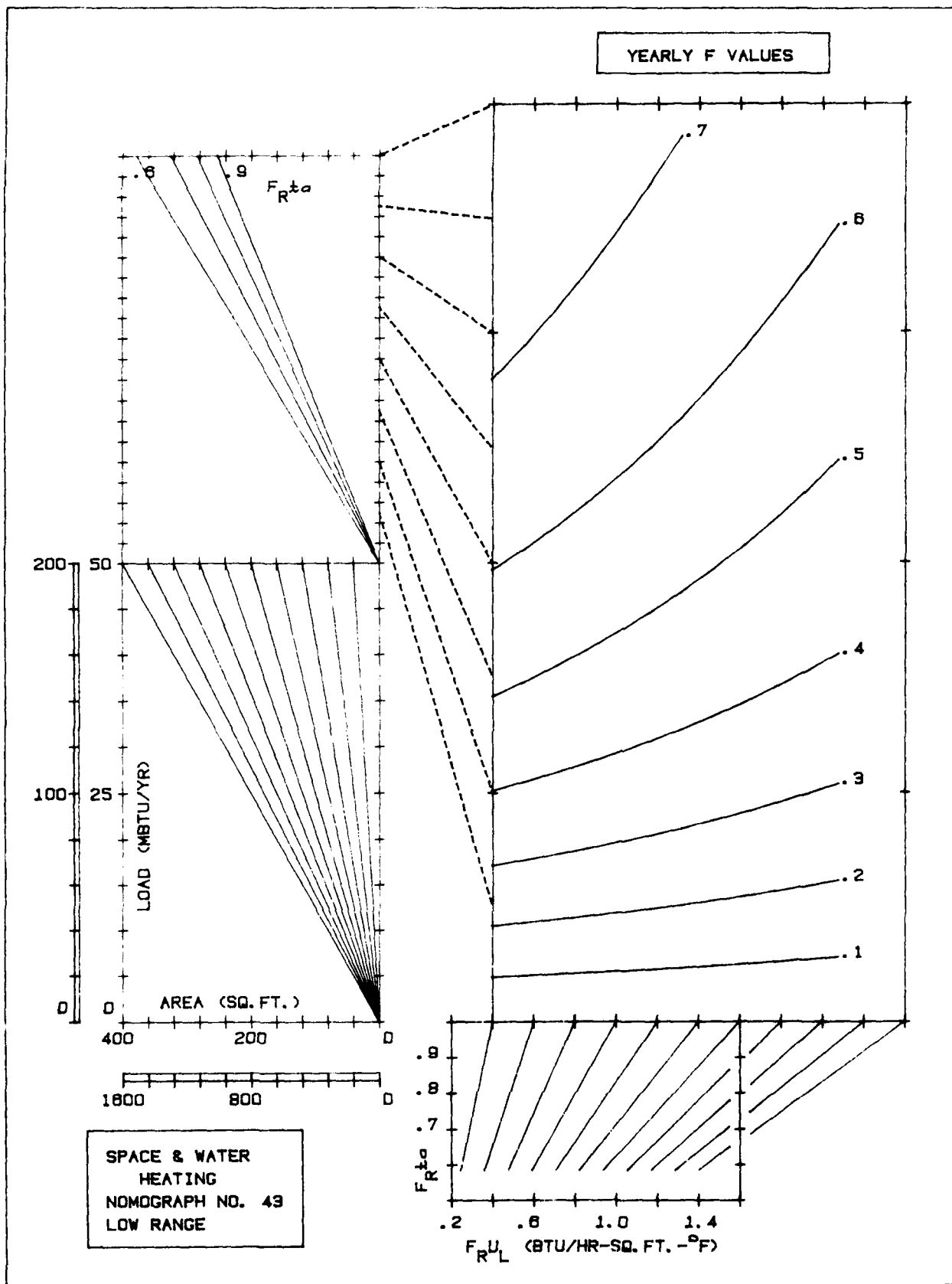


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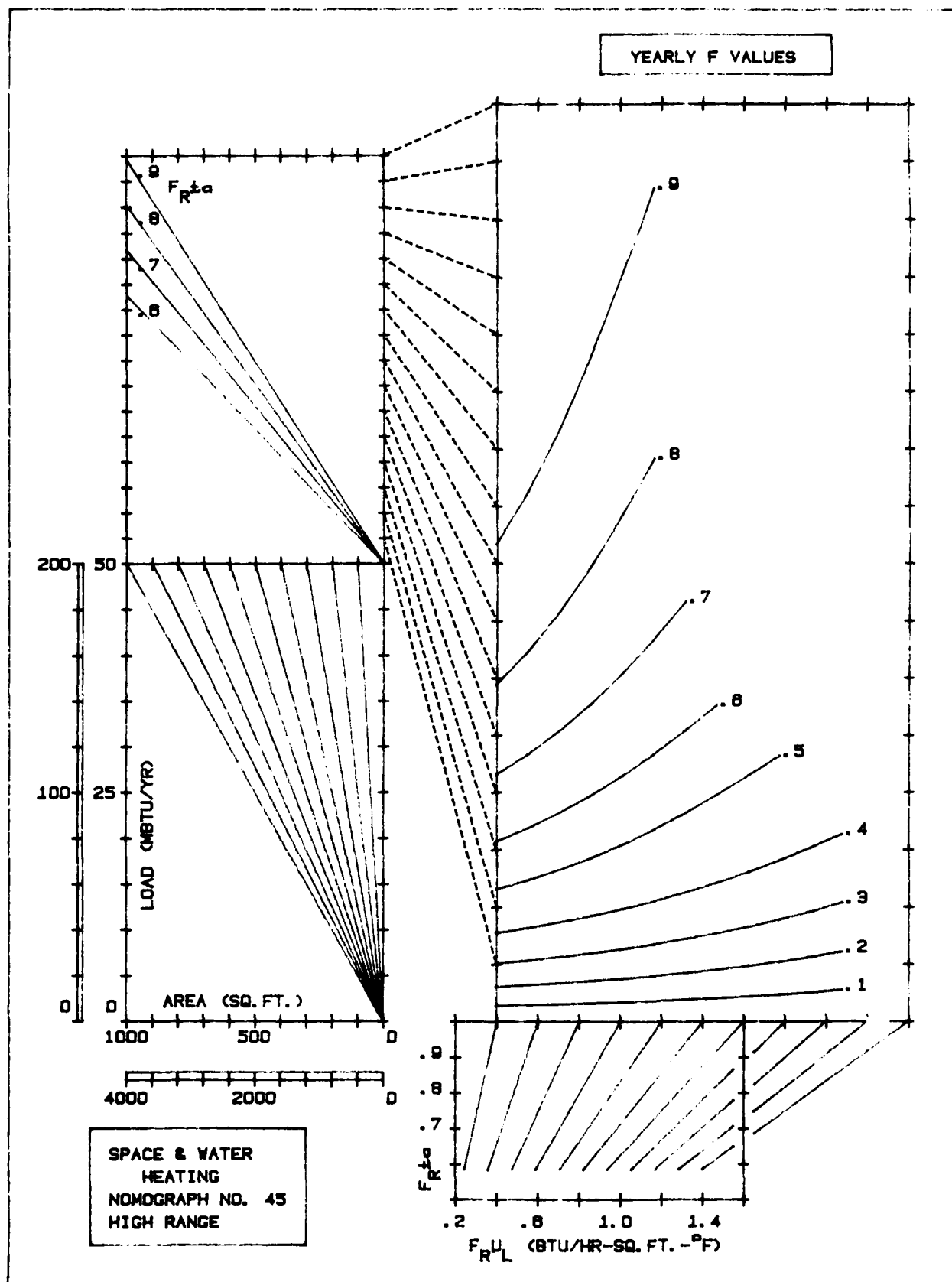




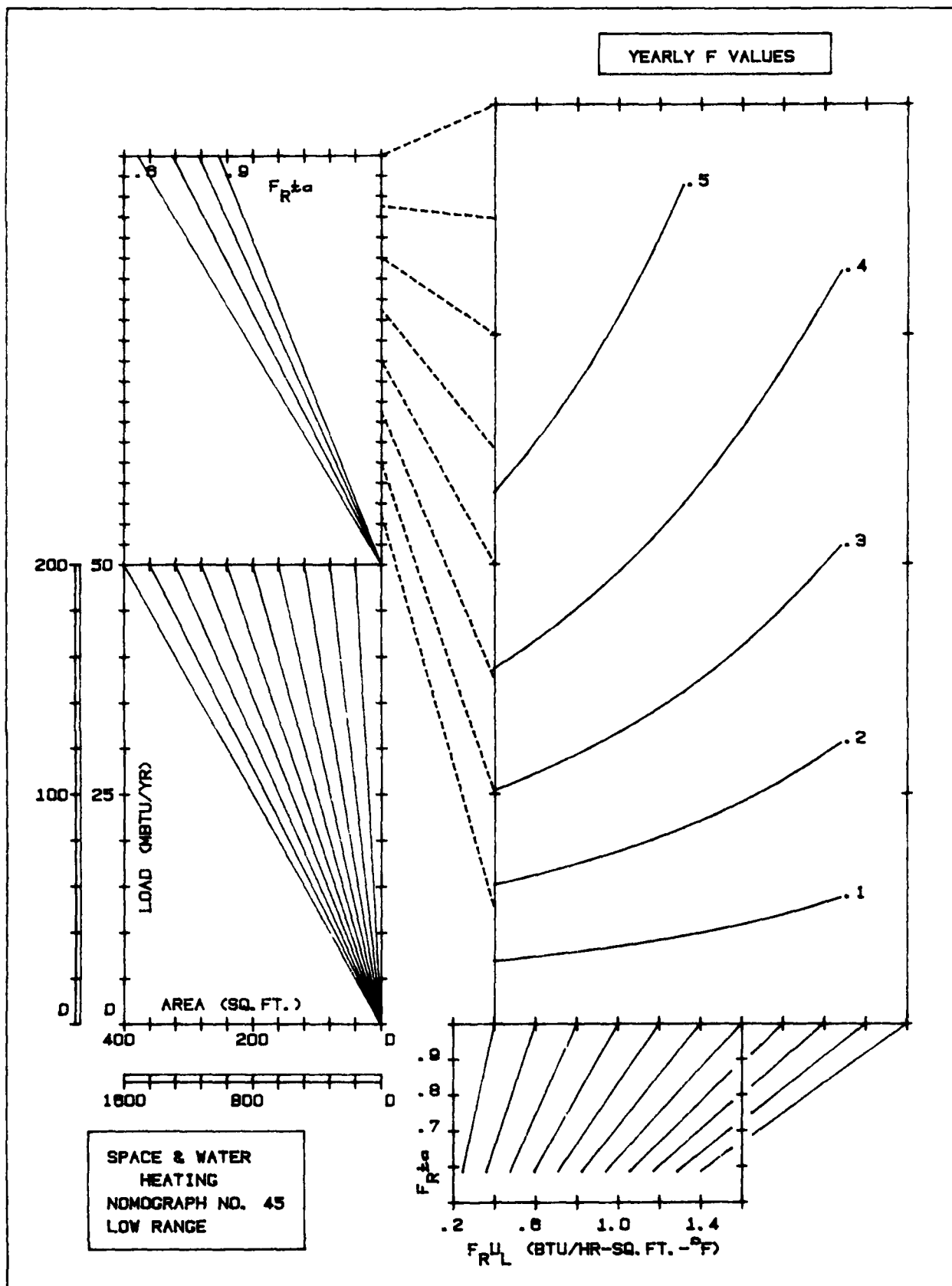
PREPARED 11 JUN 82 FOR AFESC BY USAFA/DFMS



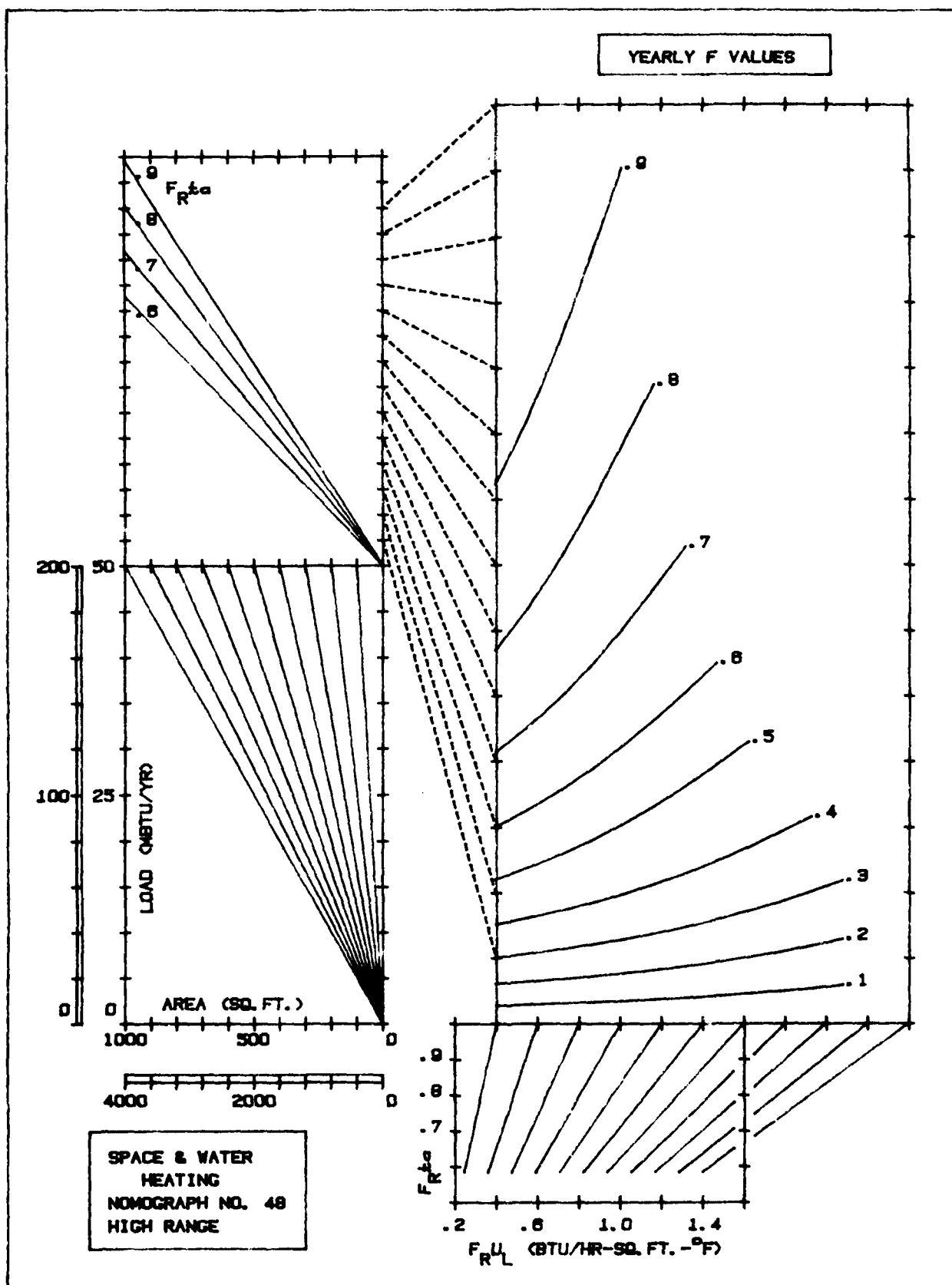
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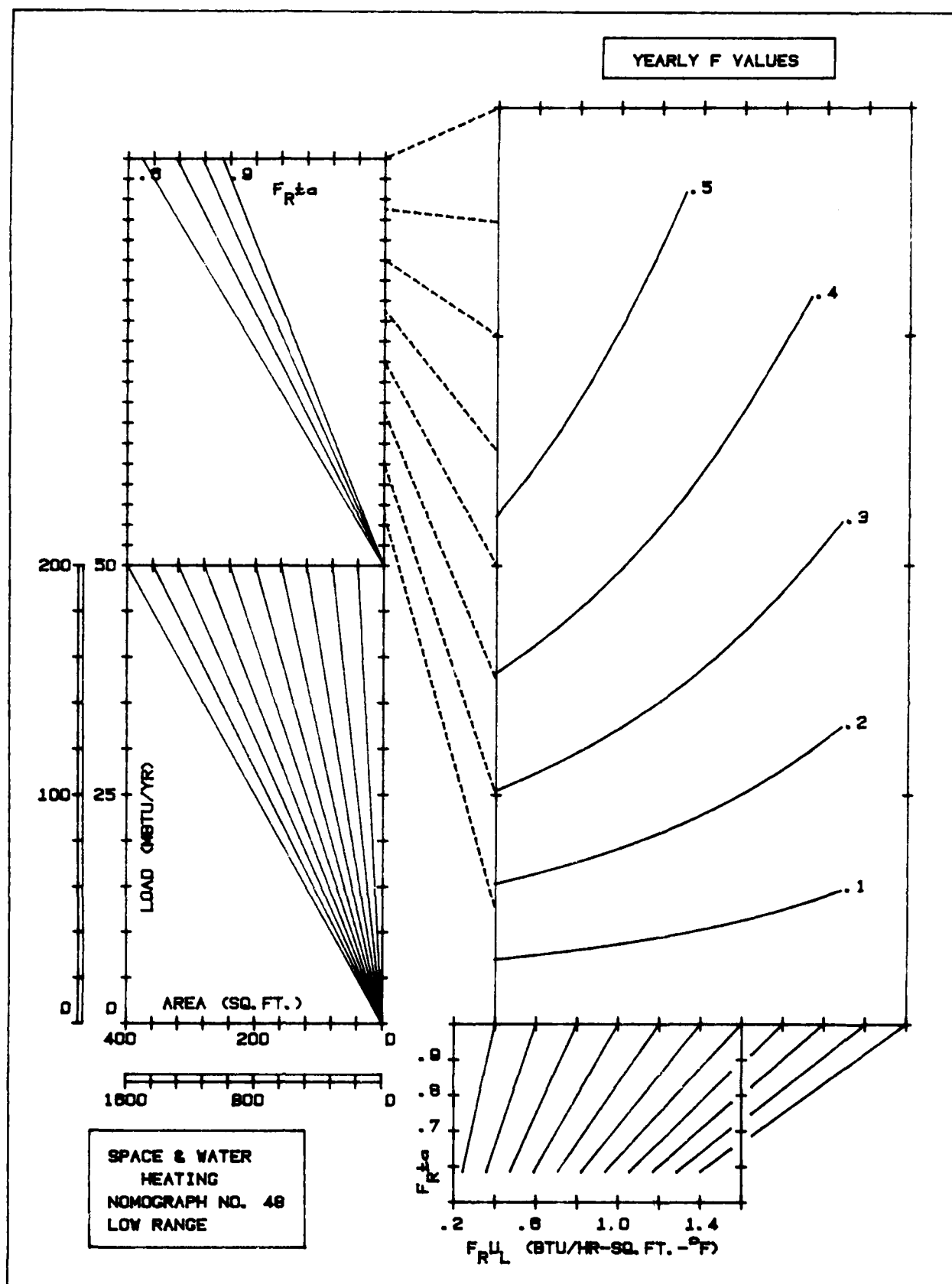
PREPARED 11 JUN 62 FOR AFESC BY USAFA/DFMS



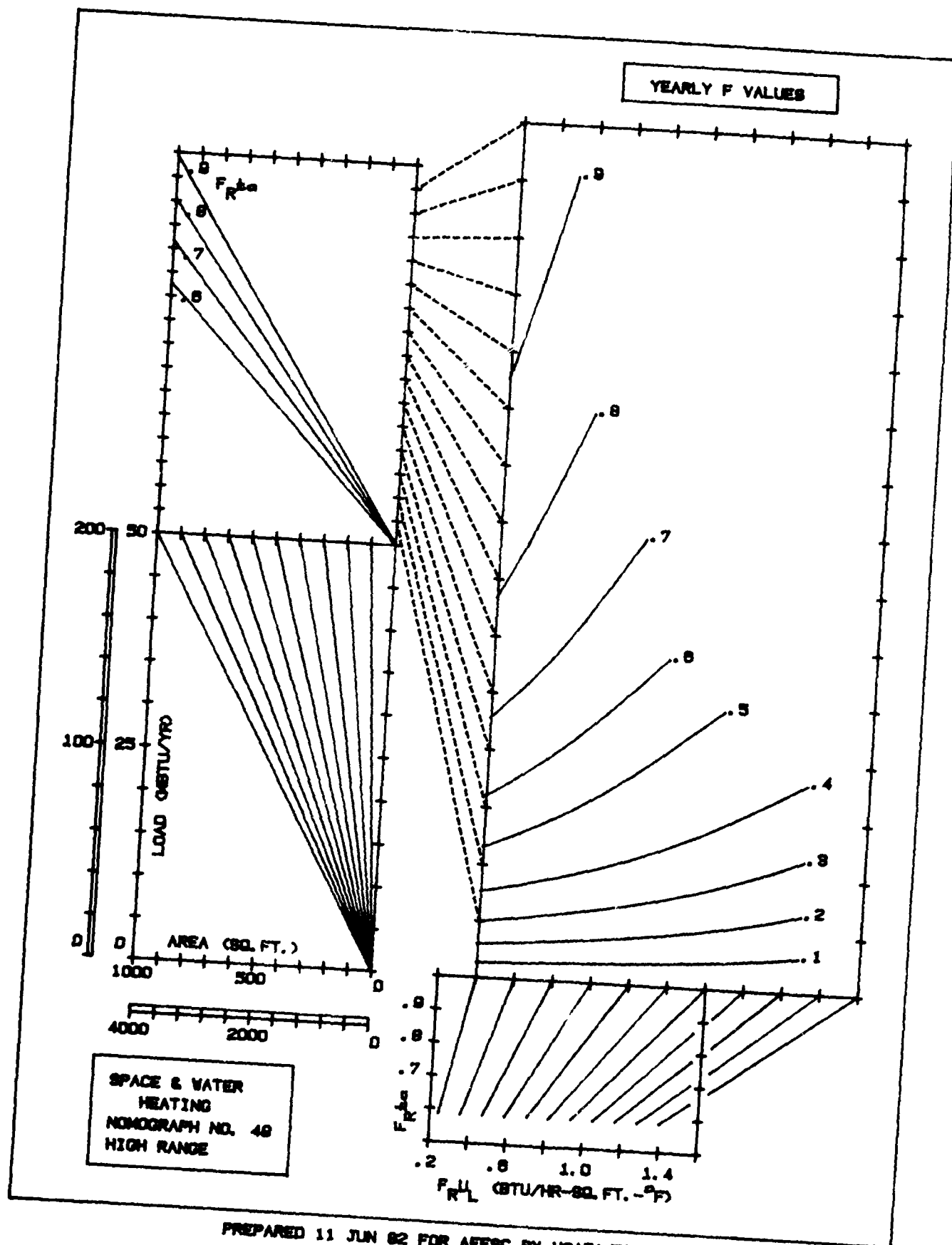
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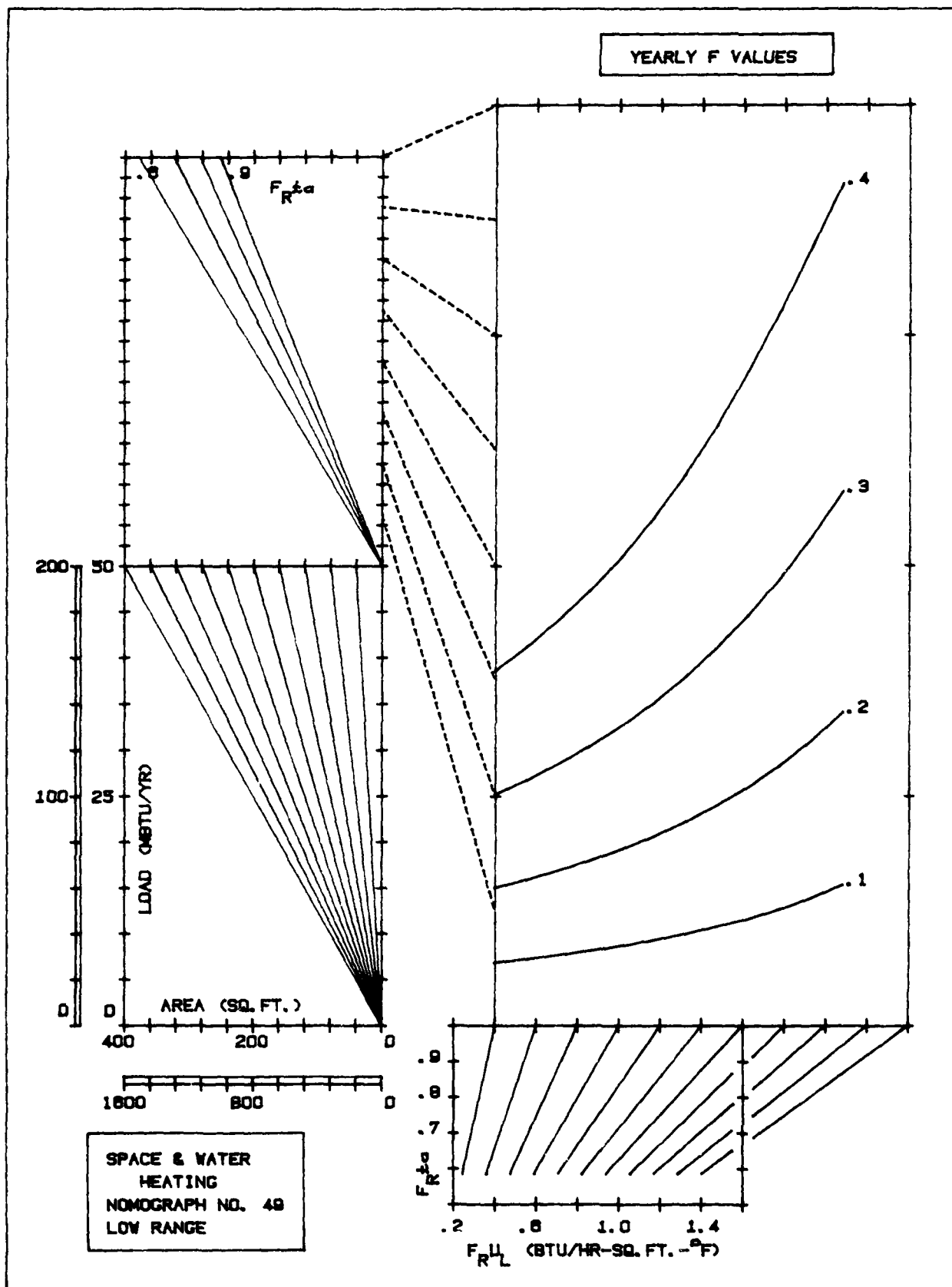
PREPARED 11 JUN 82 FOR AFESC BY USAFA/DFMS



PREPARED 06 JUL 62 FOR AFESC BY USAFA/DFMS

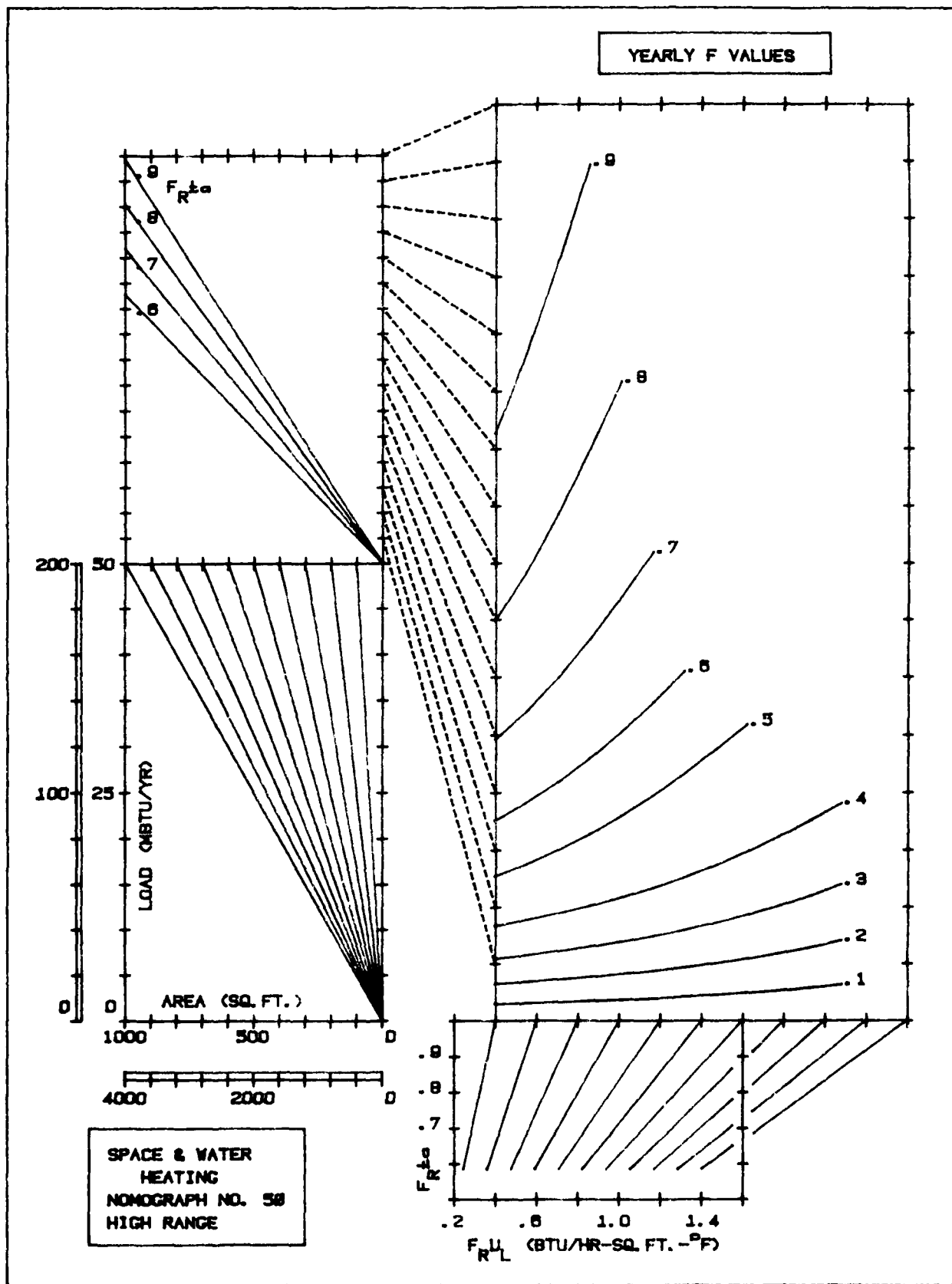


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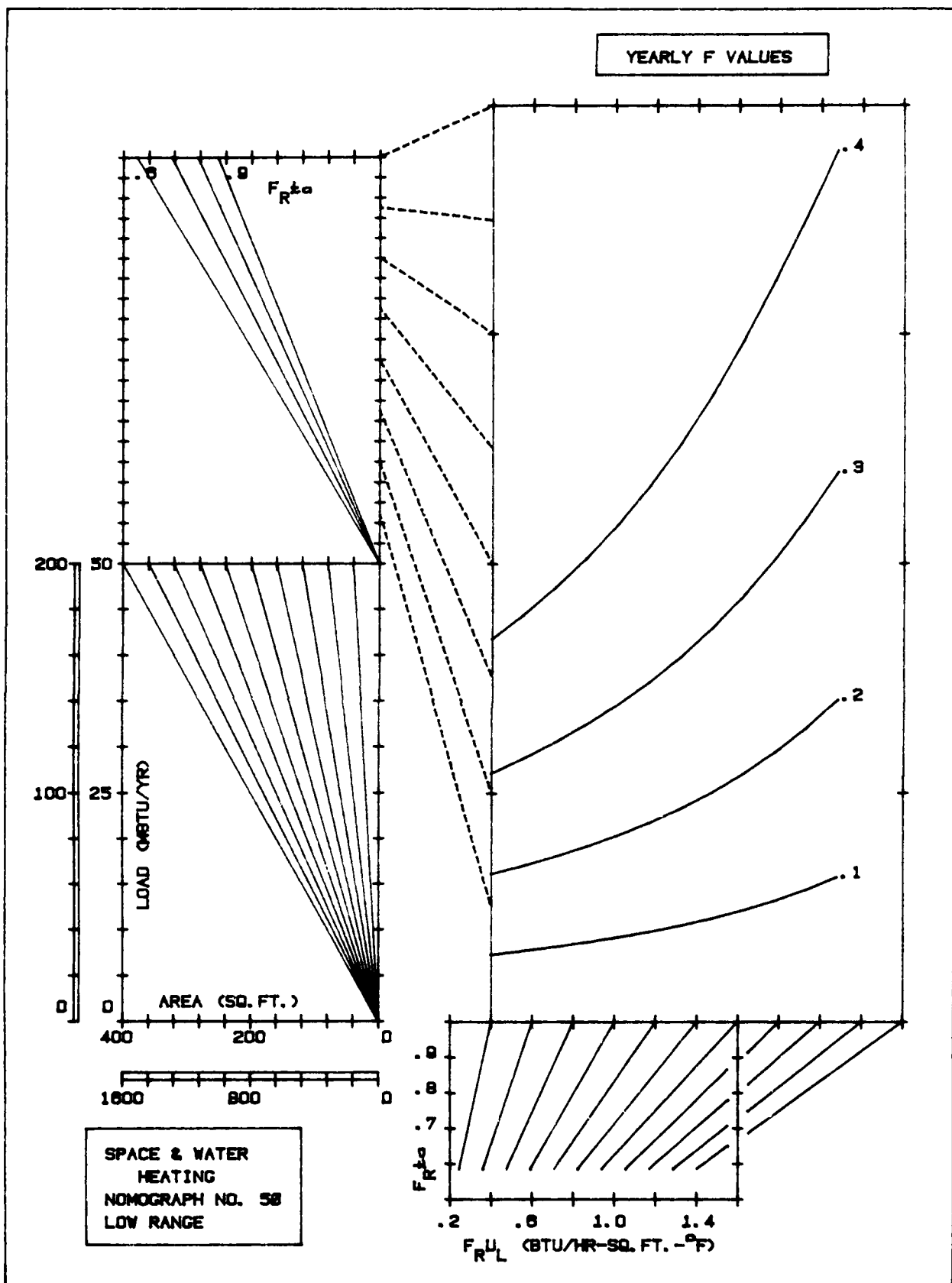


PREPARED 06 JUL 82 FOR AFESC BY USAFA/DFMS





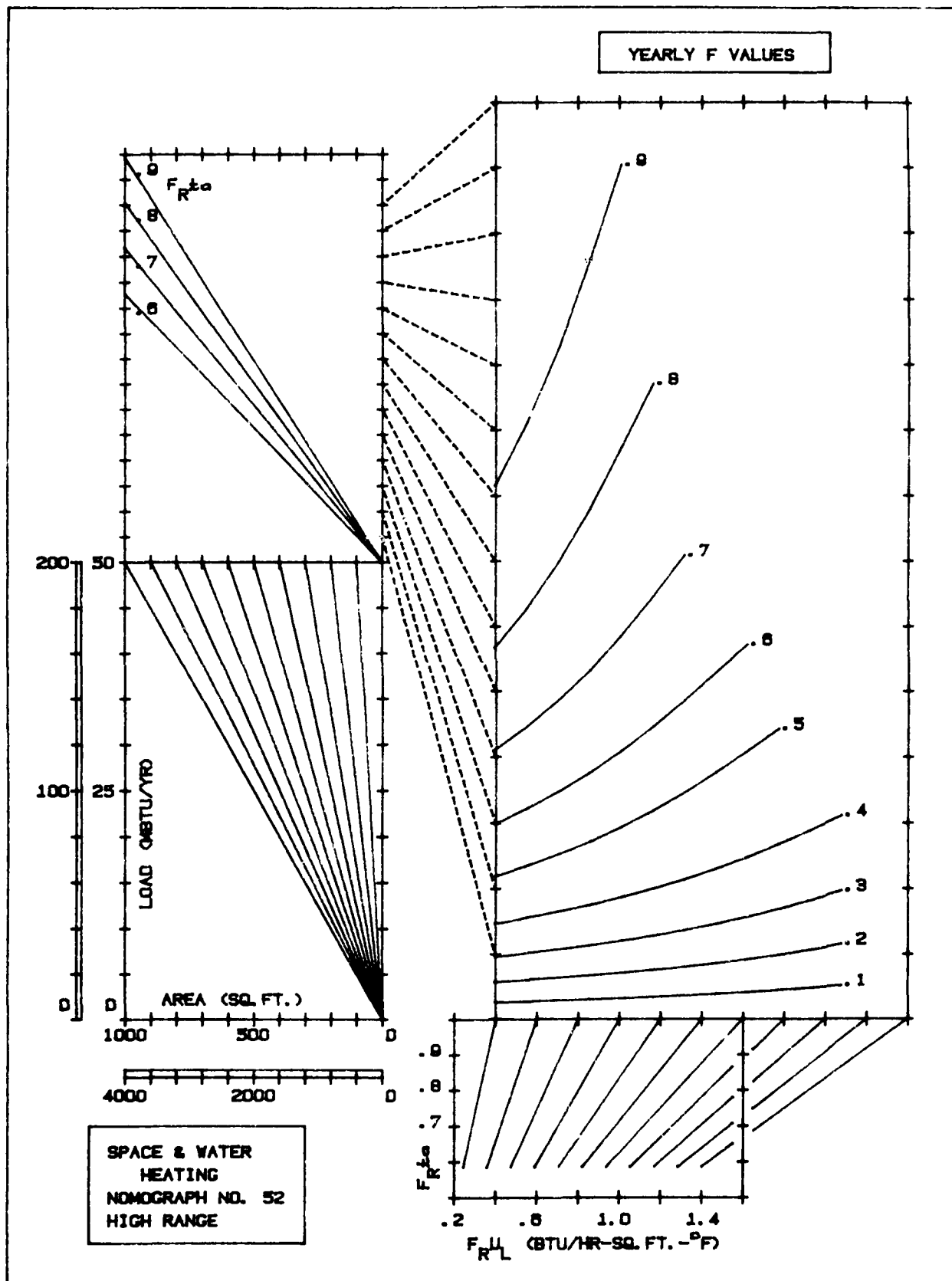
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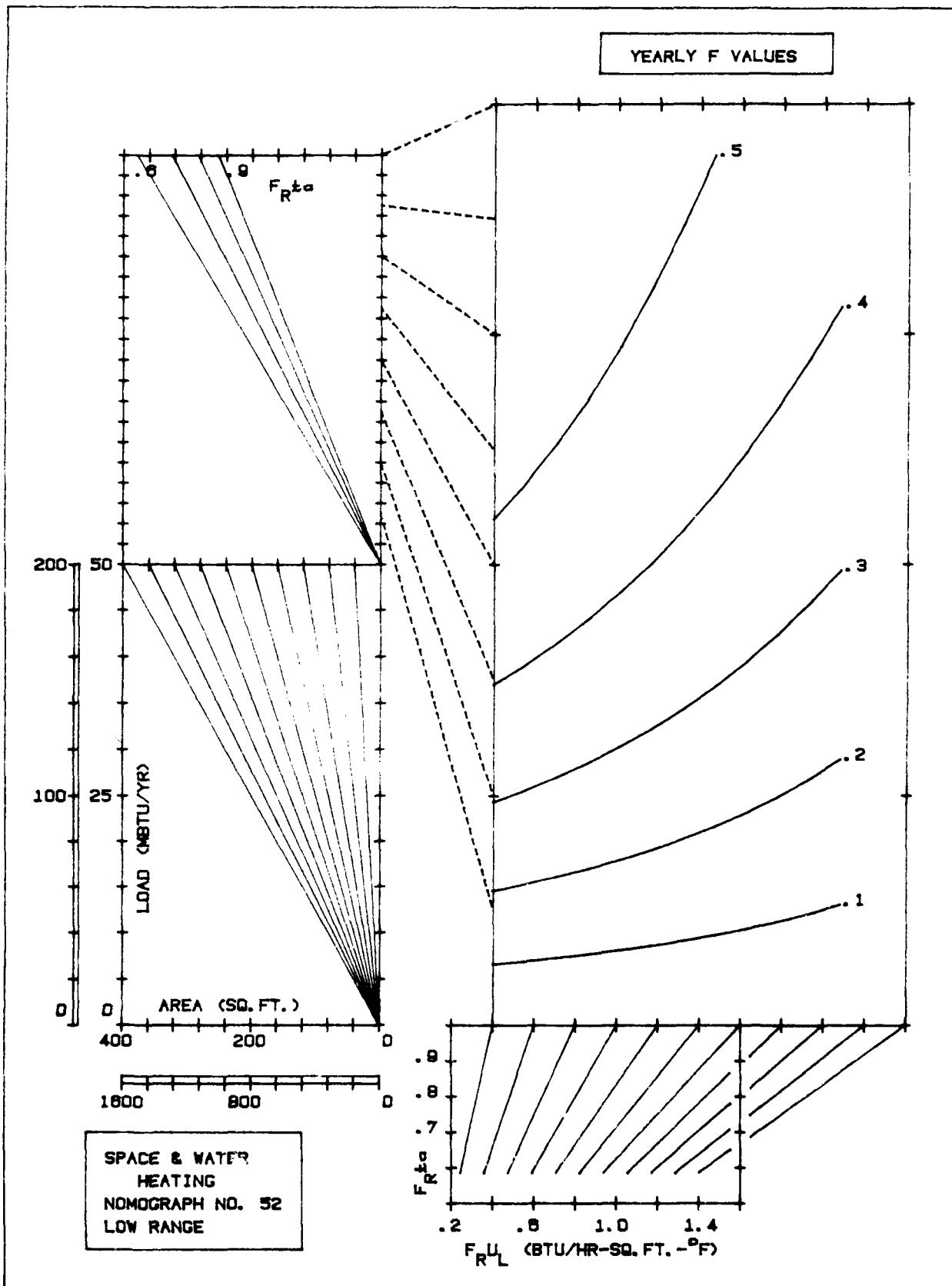
PREPARED 06 JUL 82 FOR AFESC BY USAFA/DFMS

SPACE HEATING NOMOGRAPH NO. 51,  
HIGH RANGE, NOT USABLE

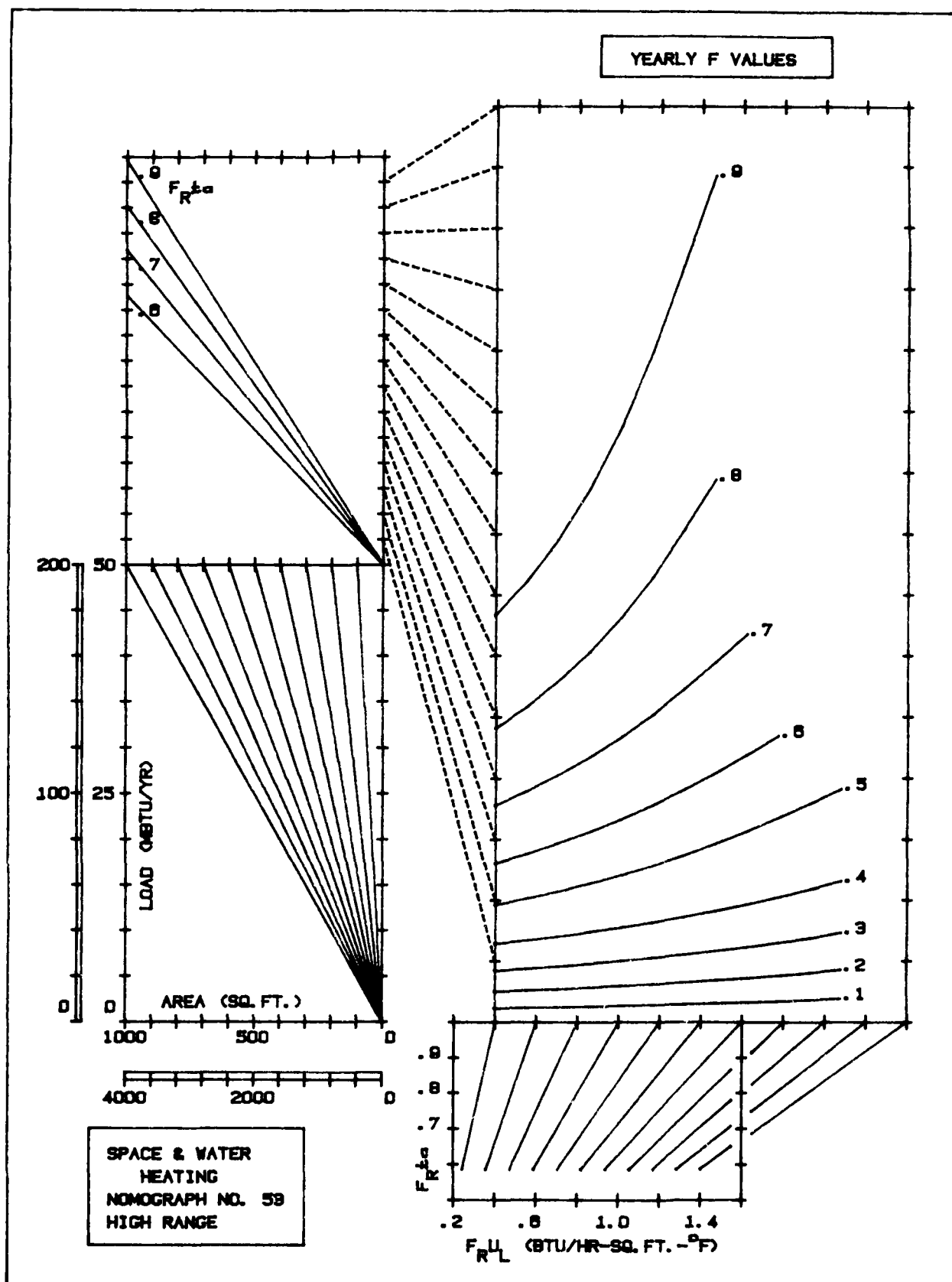
B80



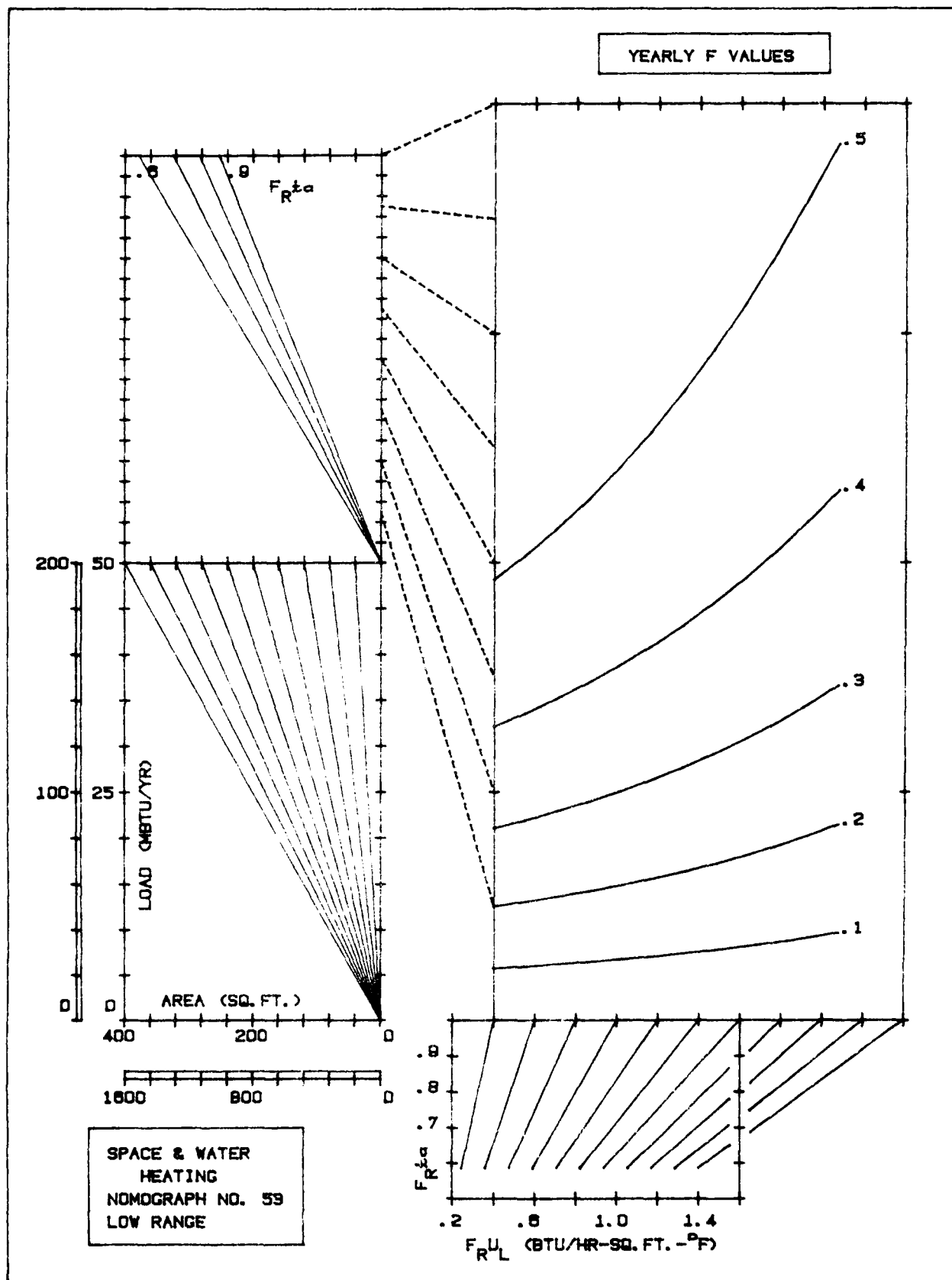
PREPARED 11 JUN 82 FOR AFESC BY USAFA/DFMS



PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

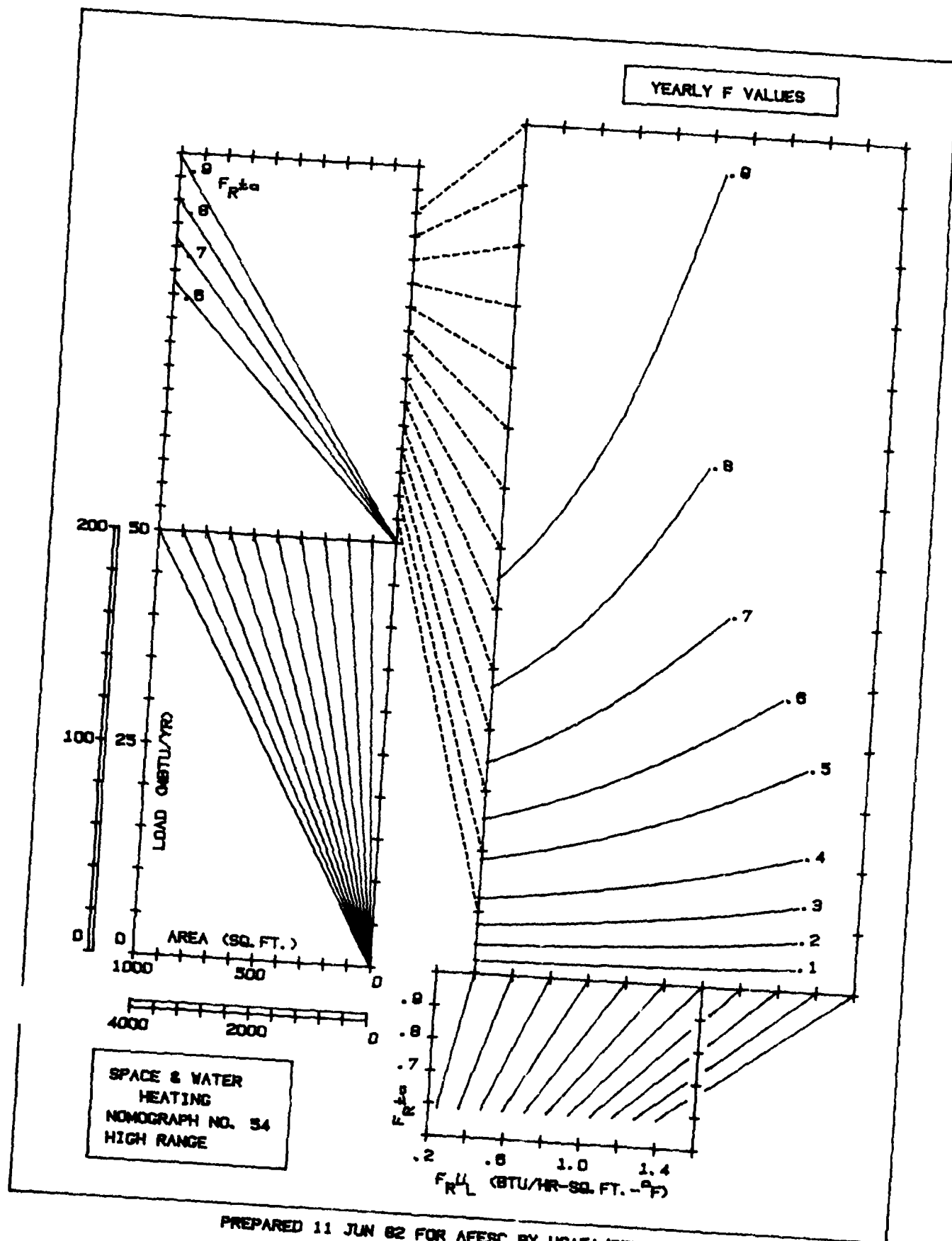


PREPARED 11 JUN 82 FOR AFESC BY USAFA/DFMS

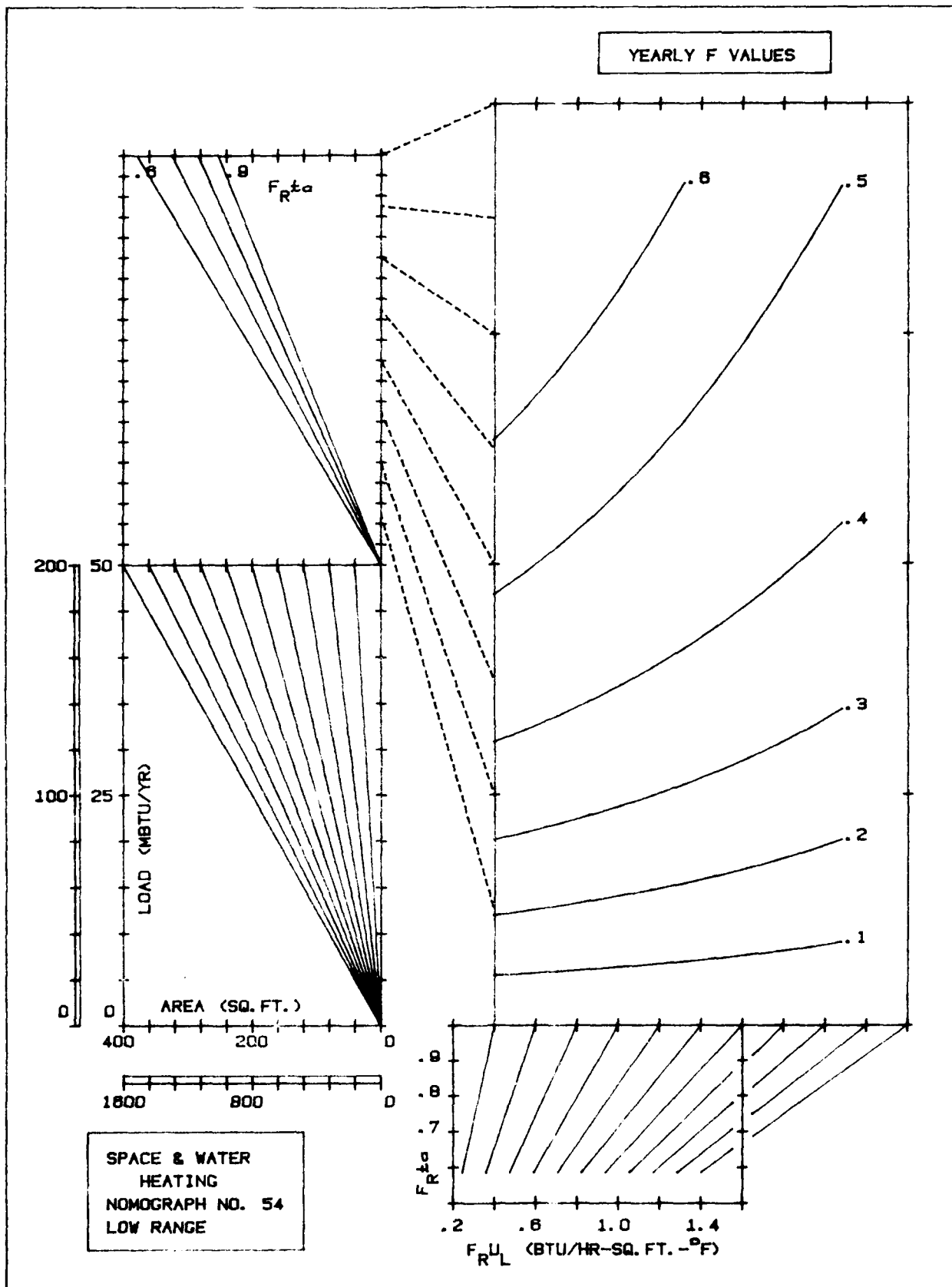


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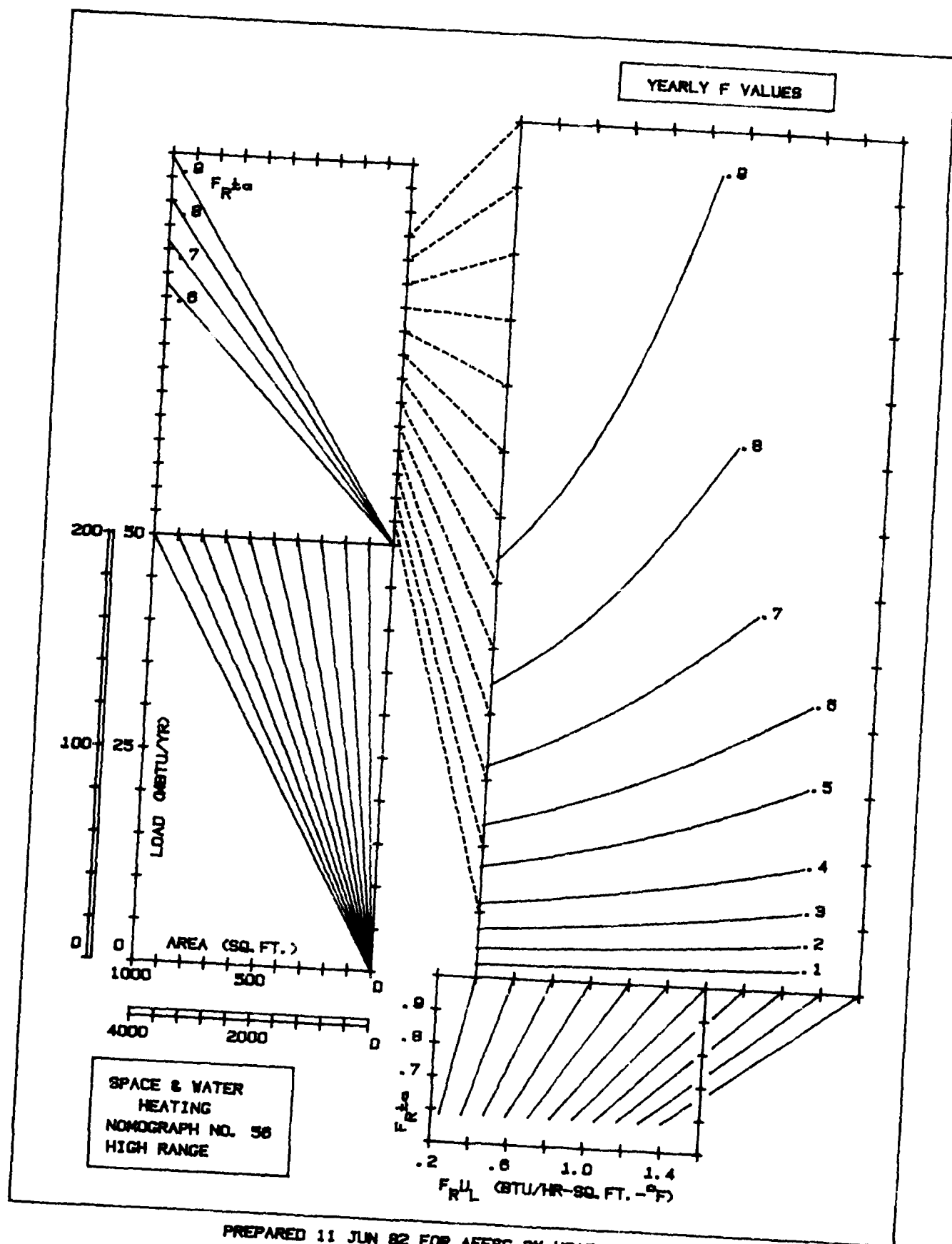


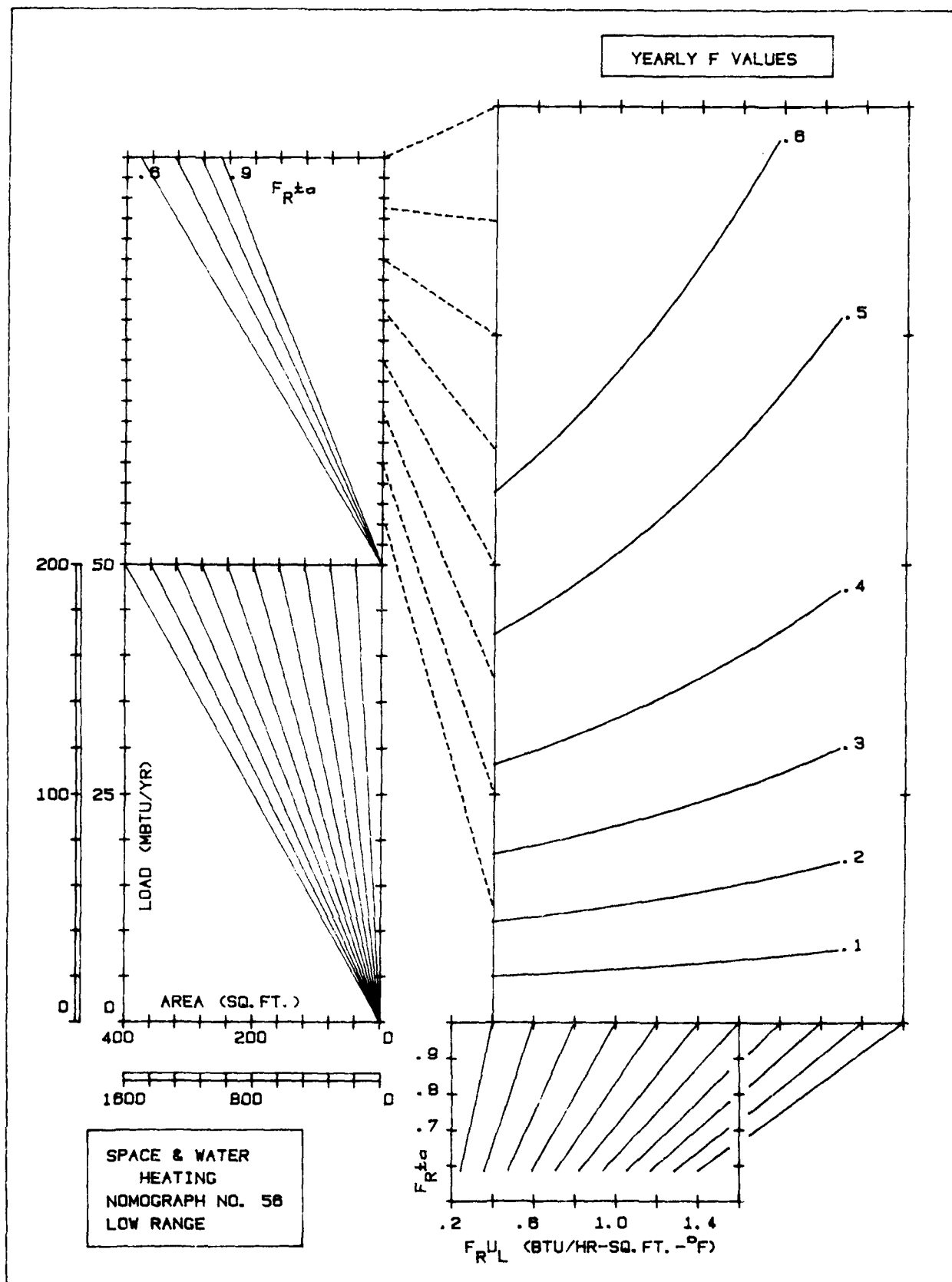


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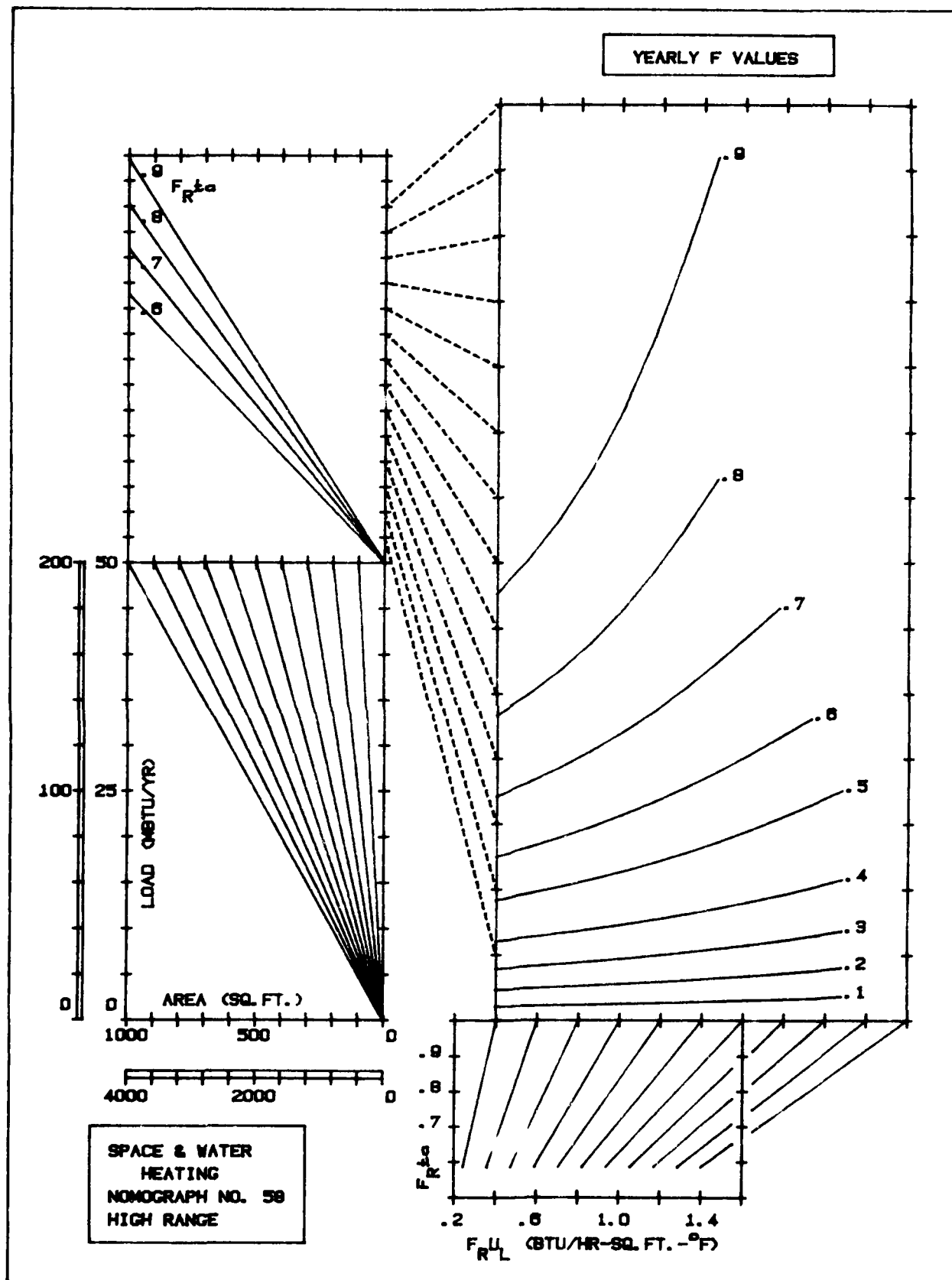


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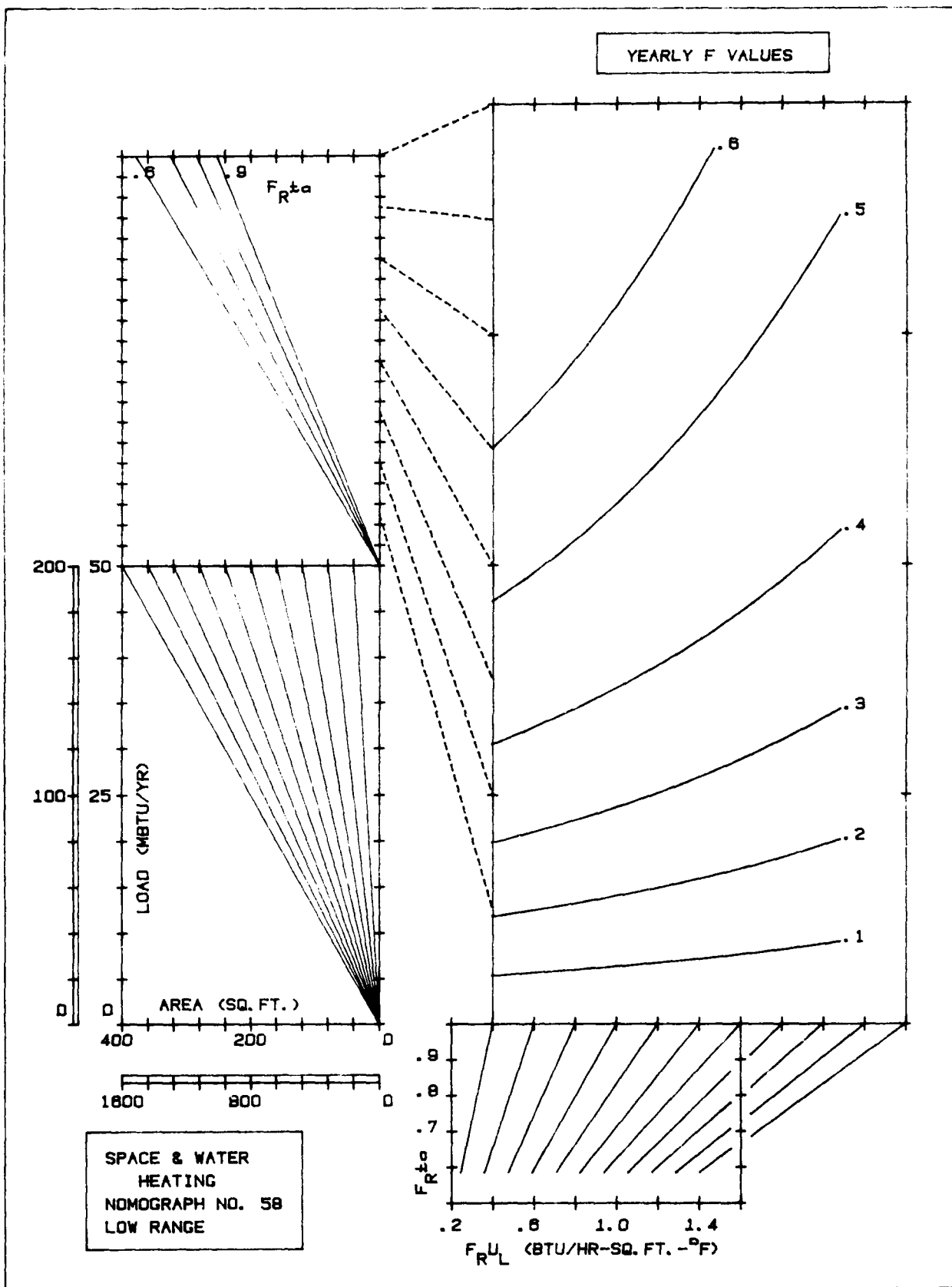




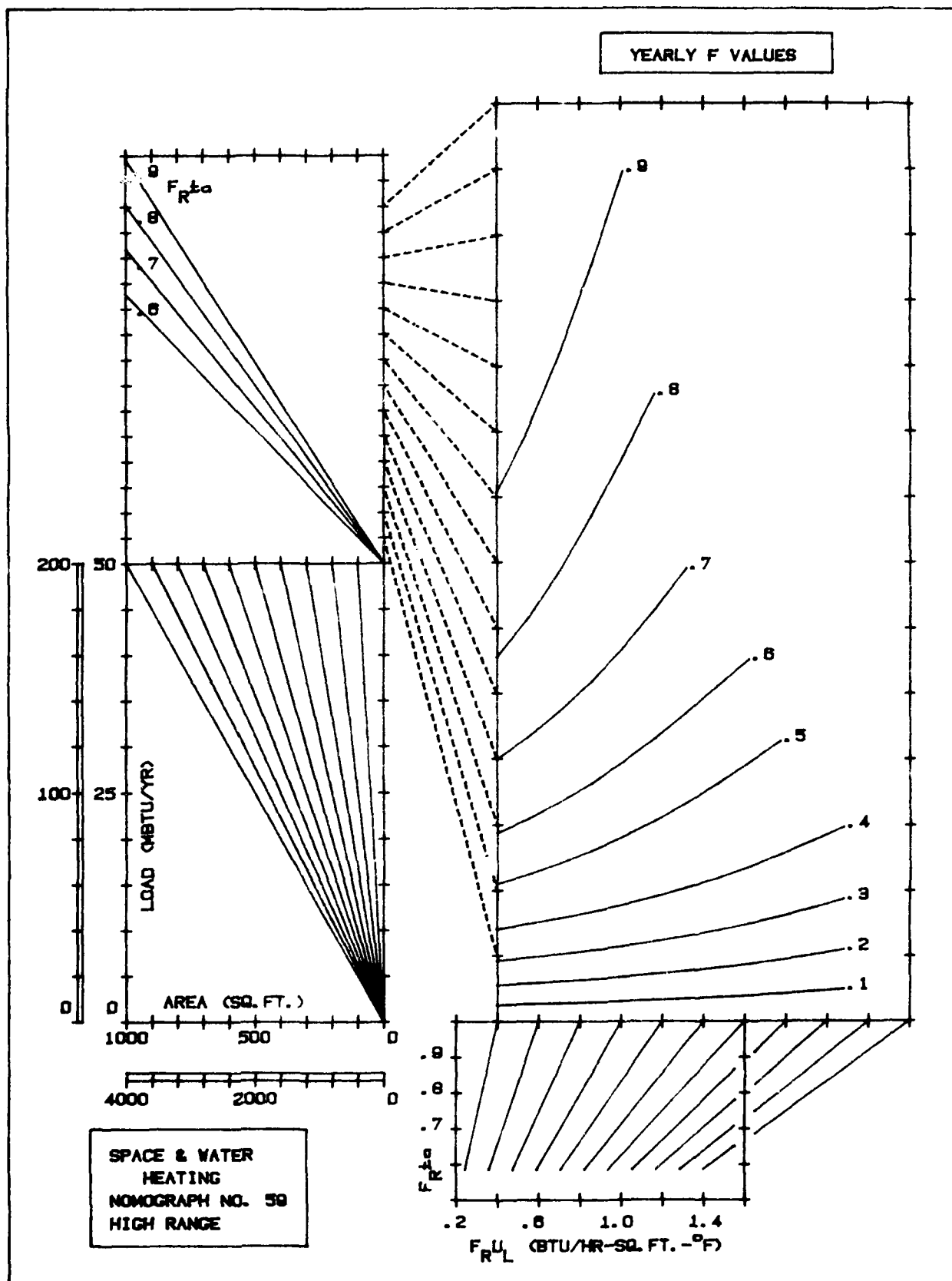
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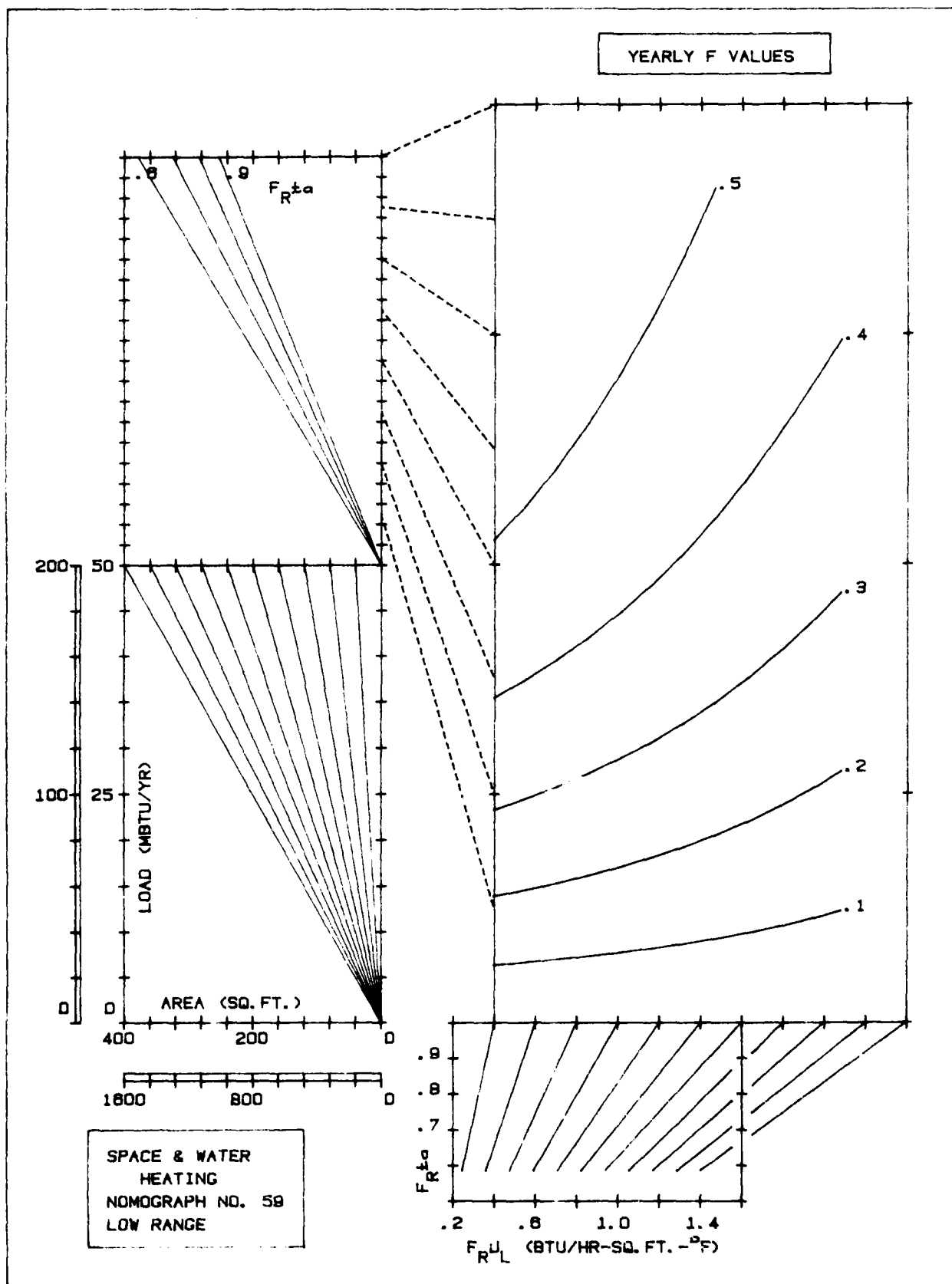
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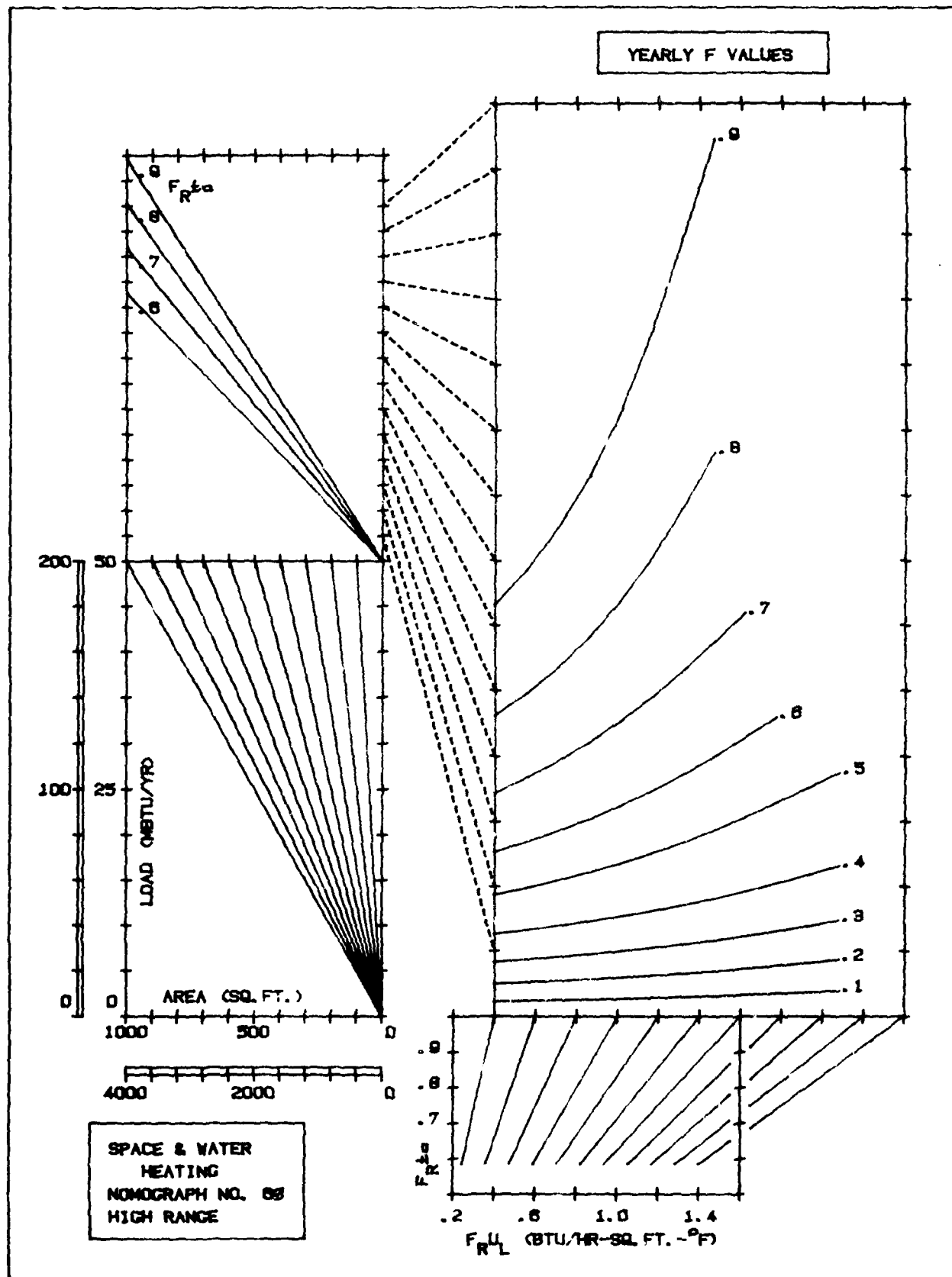


PREPARED 11 JUN 62 FOR AFESC BY USAFA/DFMS



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PREPARED 11 JUN 82 FOR AFESC BY USAFA/DFMS

AD-A120 014

AIR FORCE ACADEMY CO  
SIMPLIFIED SOLAR FRACTION ESTIMATION FOR SPACE AND WATER HEATIN--ETC(U)  
SEP 82 N S PACHECO, D G KNIOLA, J F SHEEDY

F/6 13/1

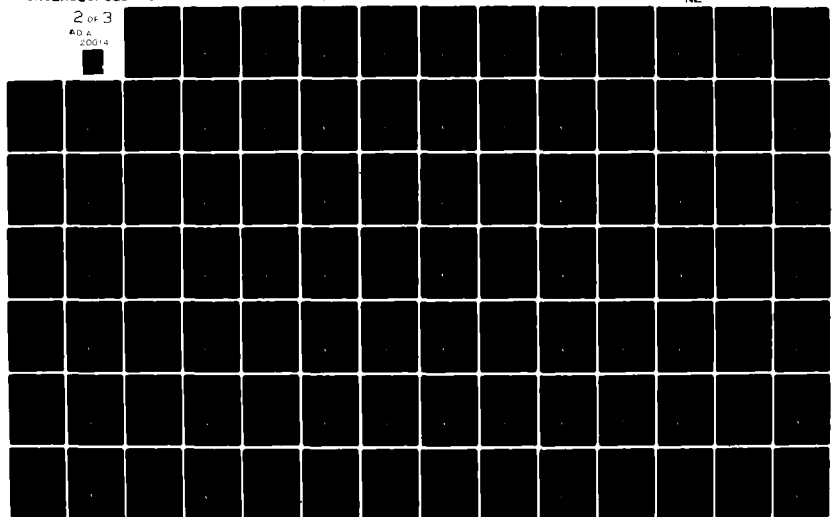
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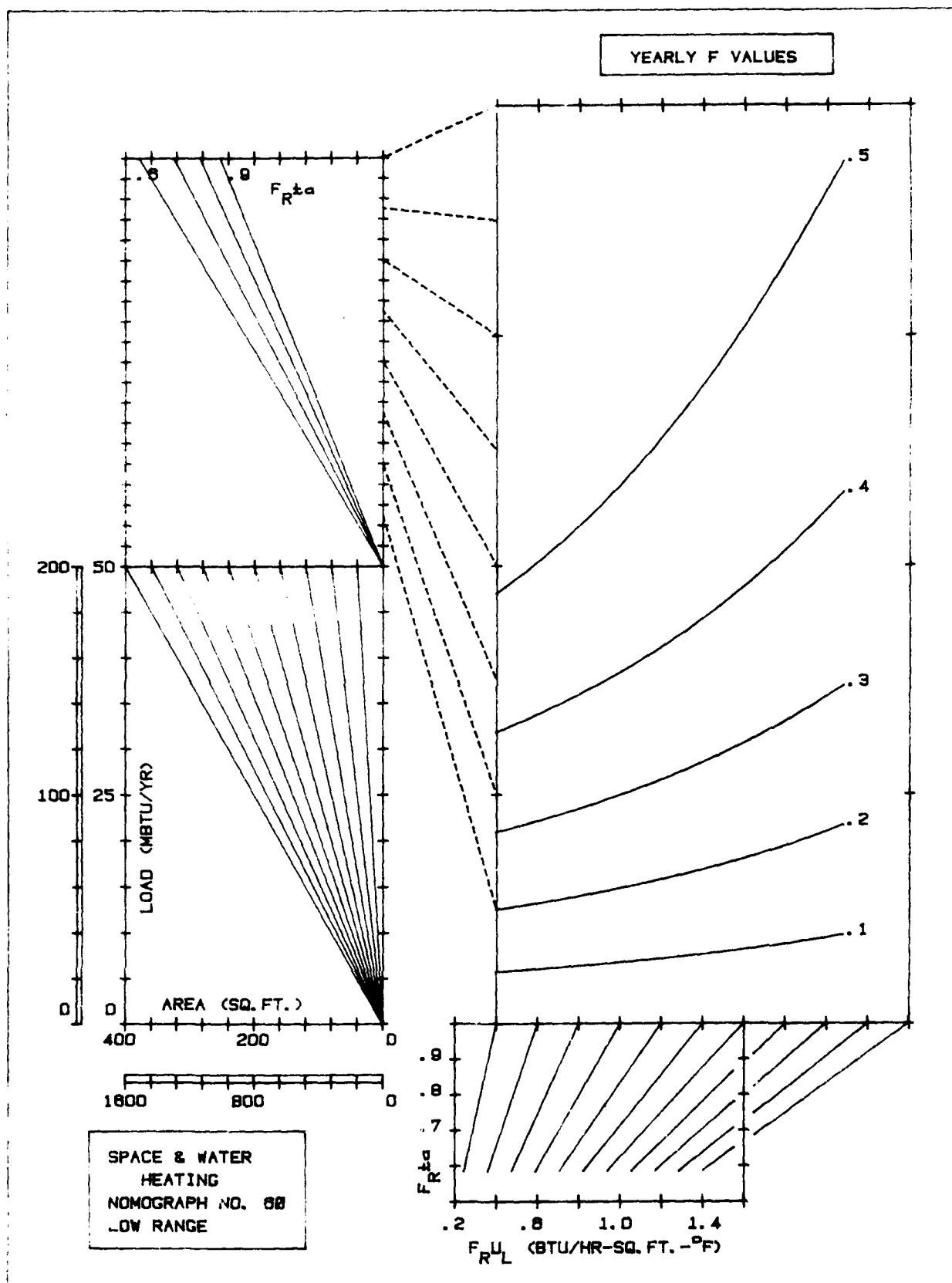
USAF-TR-82-6-APP-C

NL

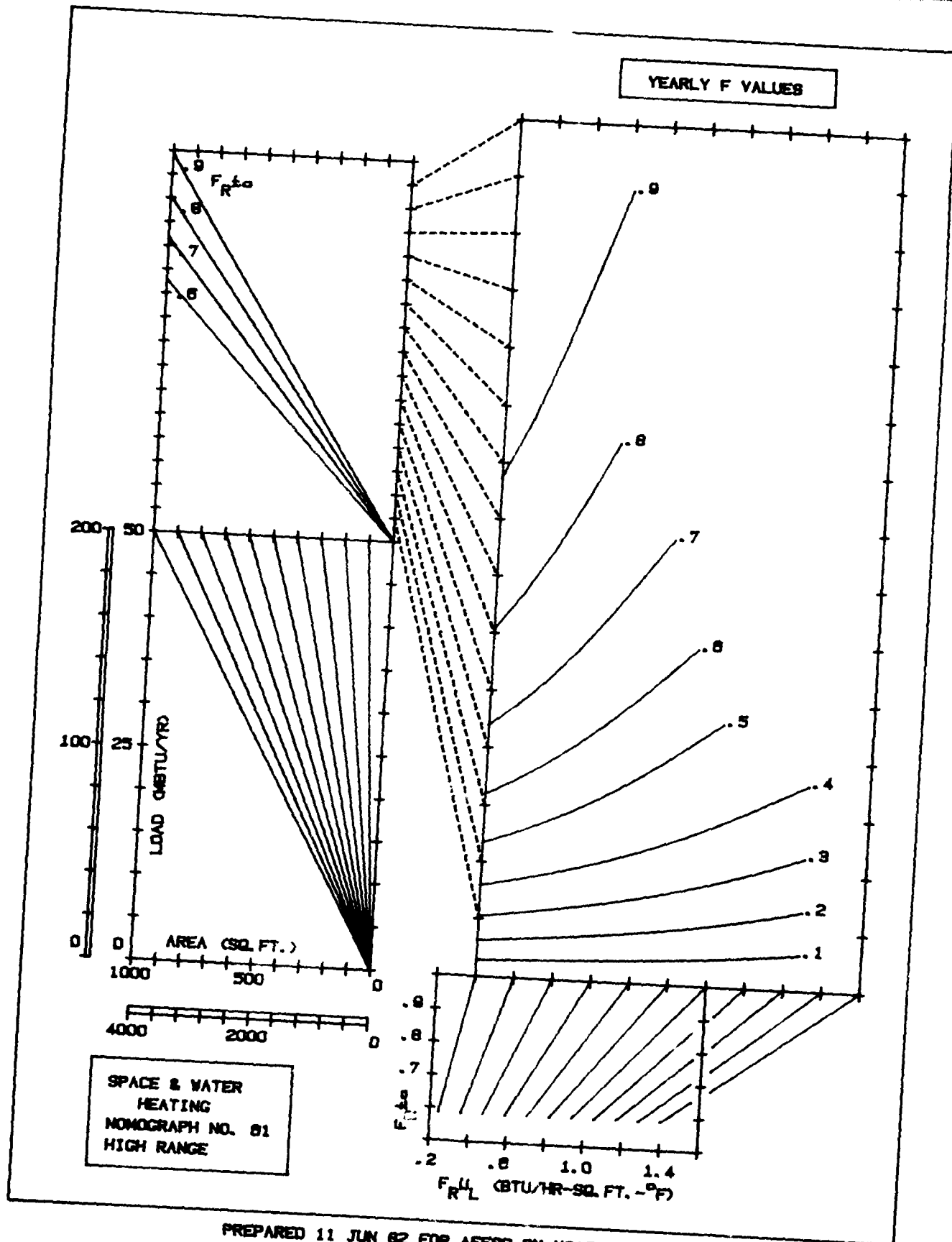
2 of 3

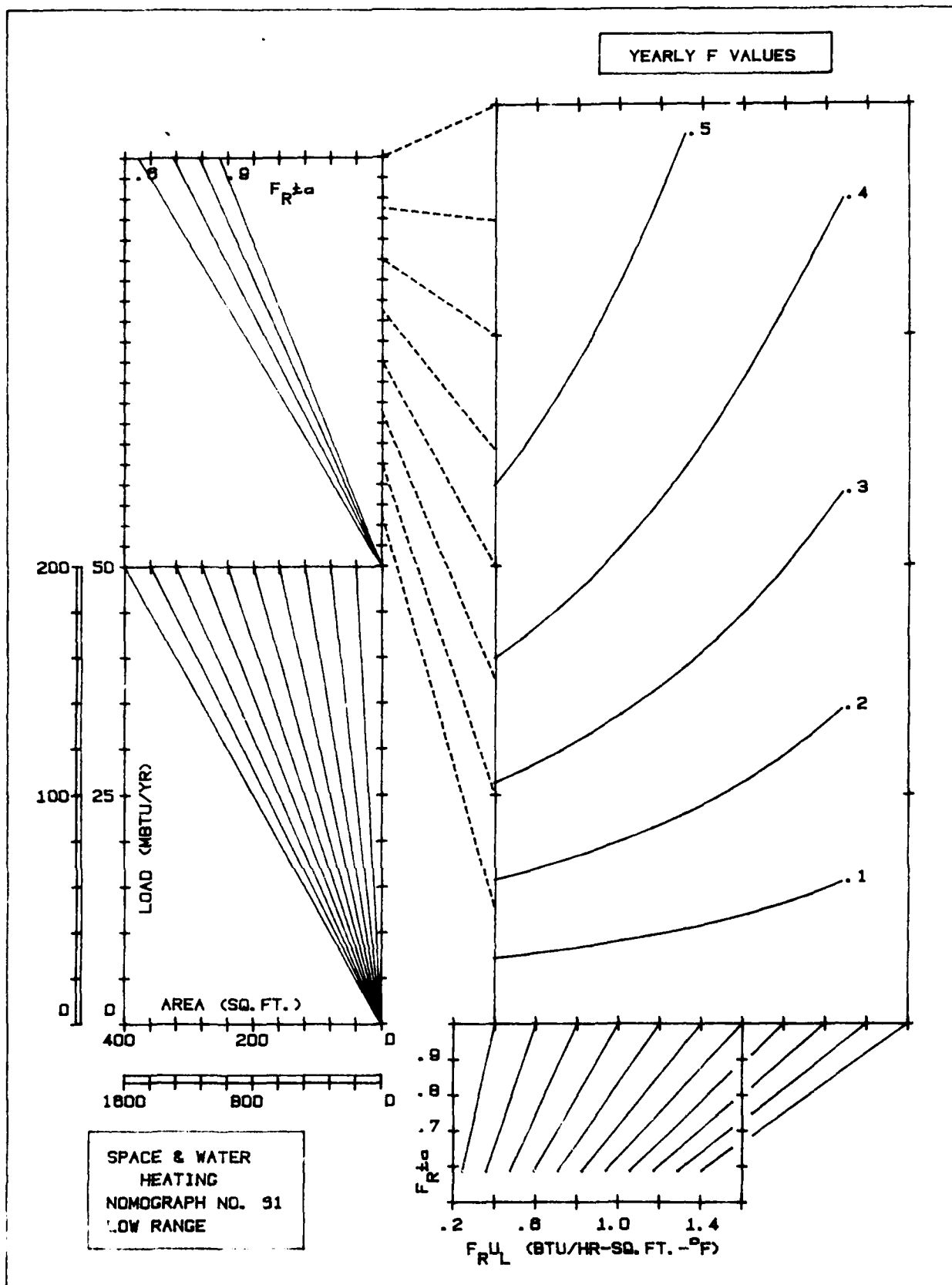
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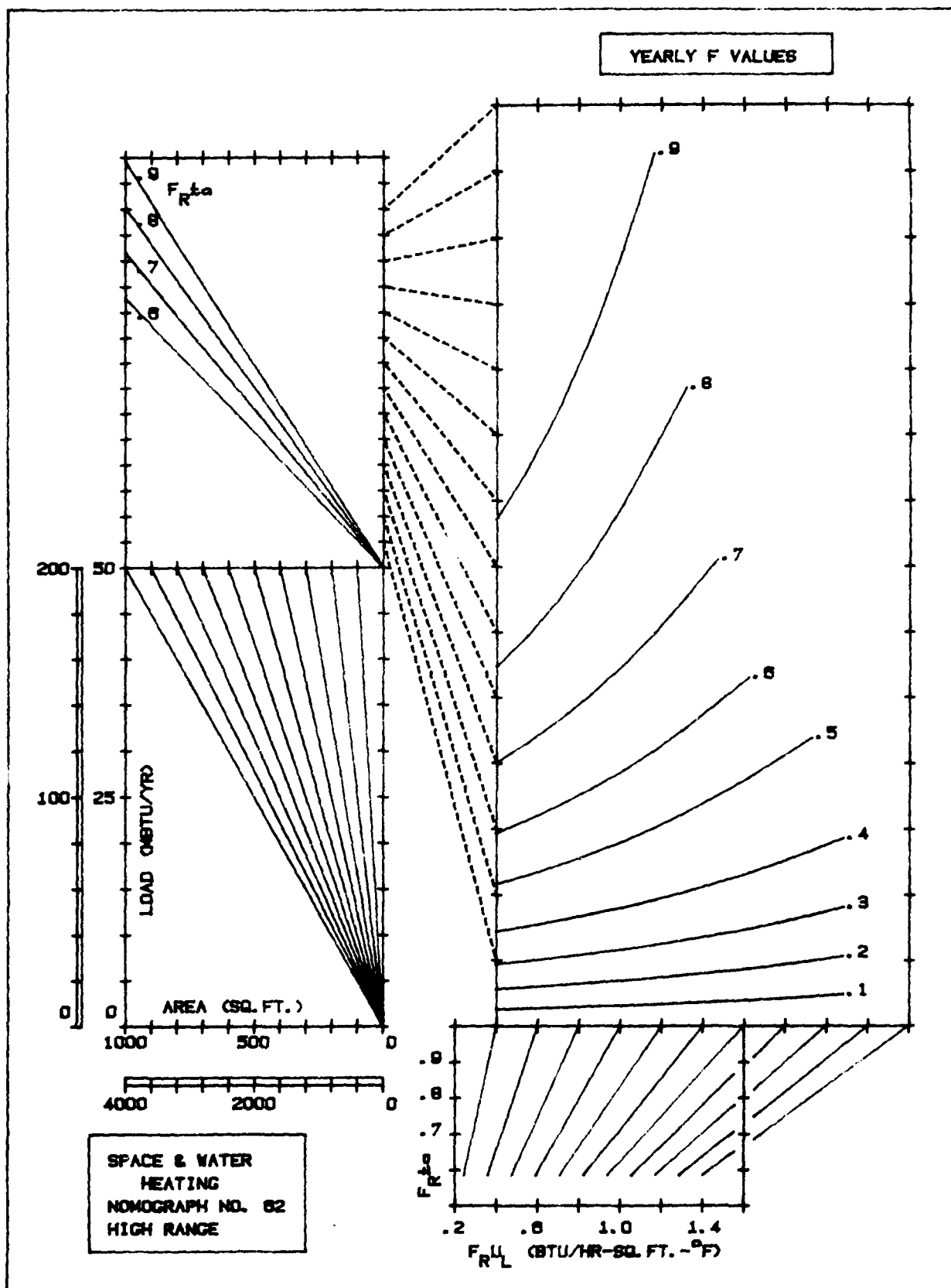


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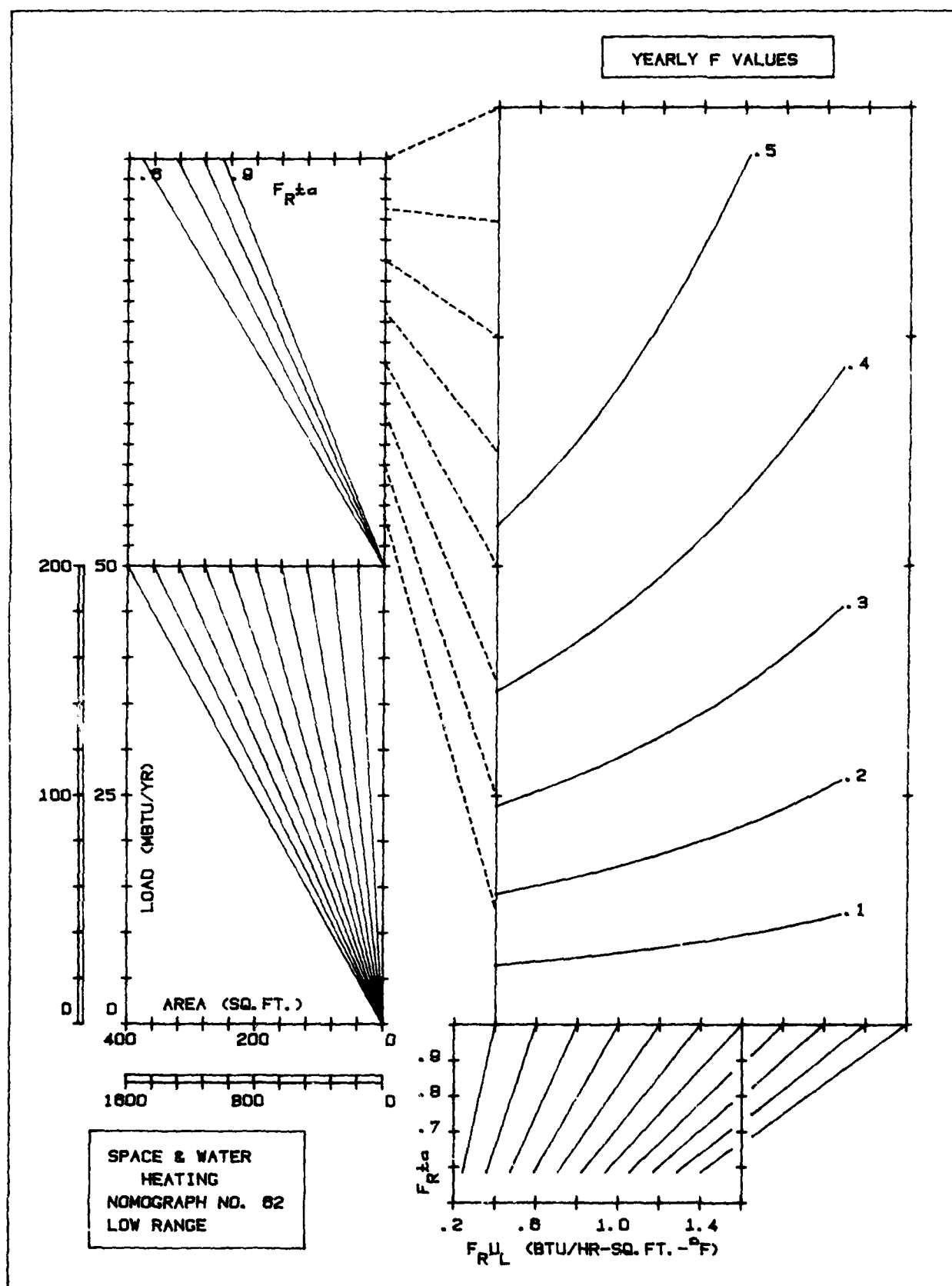




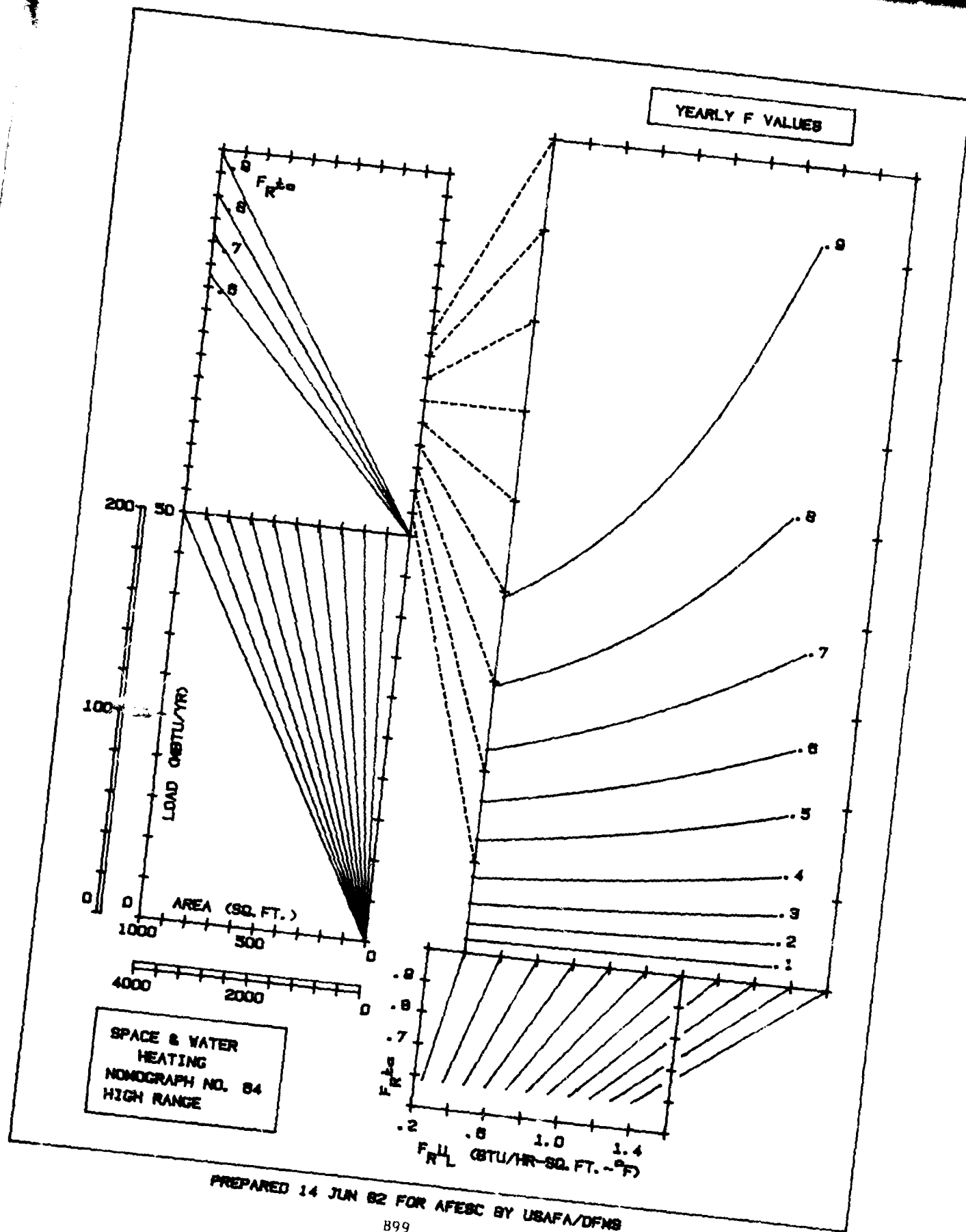
PREPARED 07 JUL 52 FOR AFESC BY USAFA/DFMS



PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS

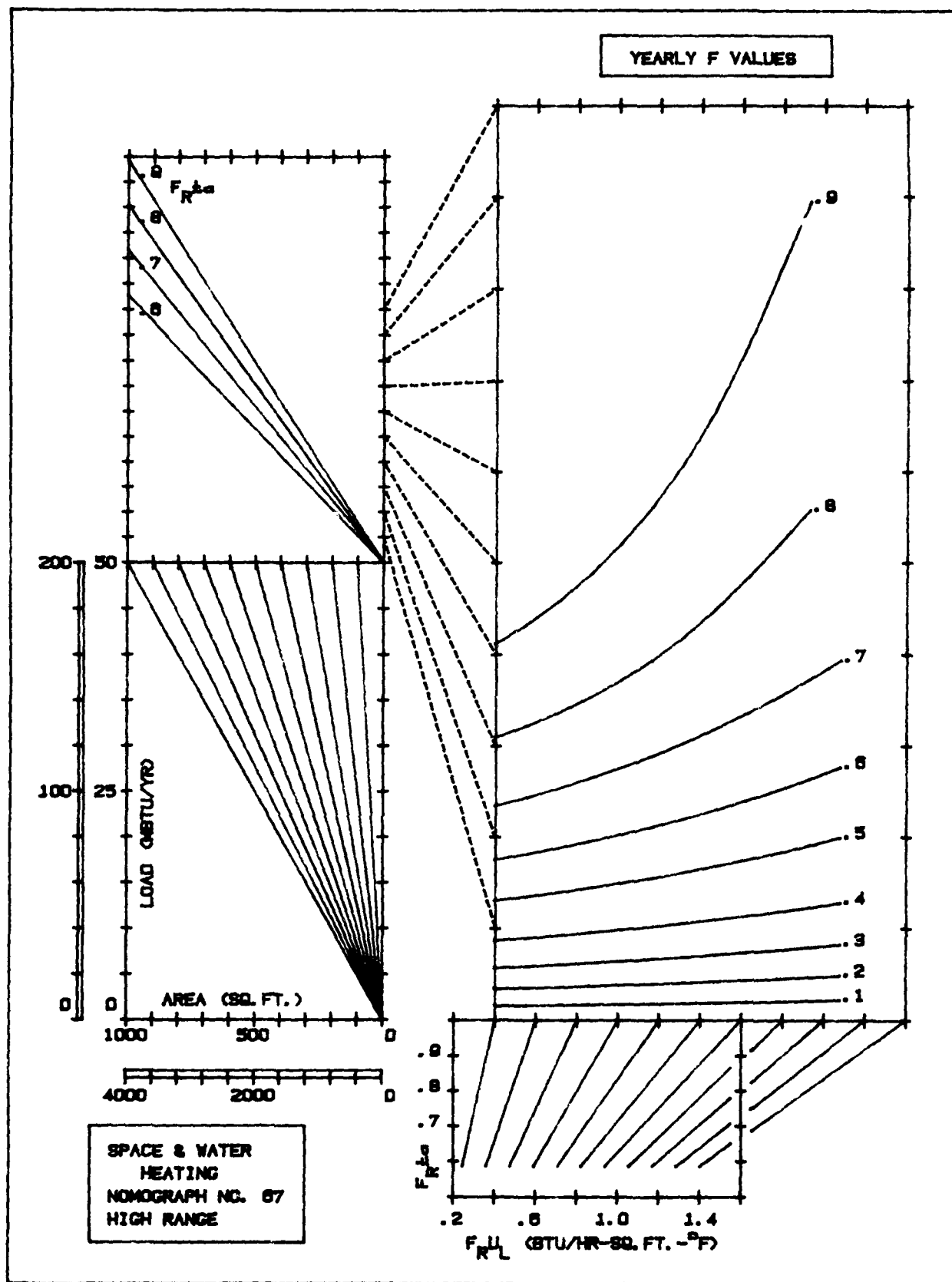


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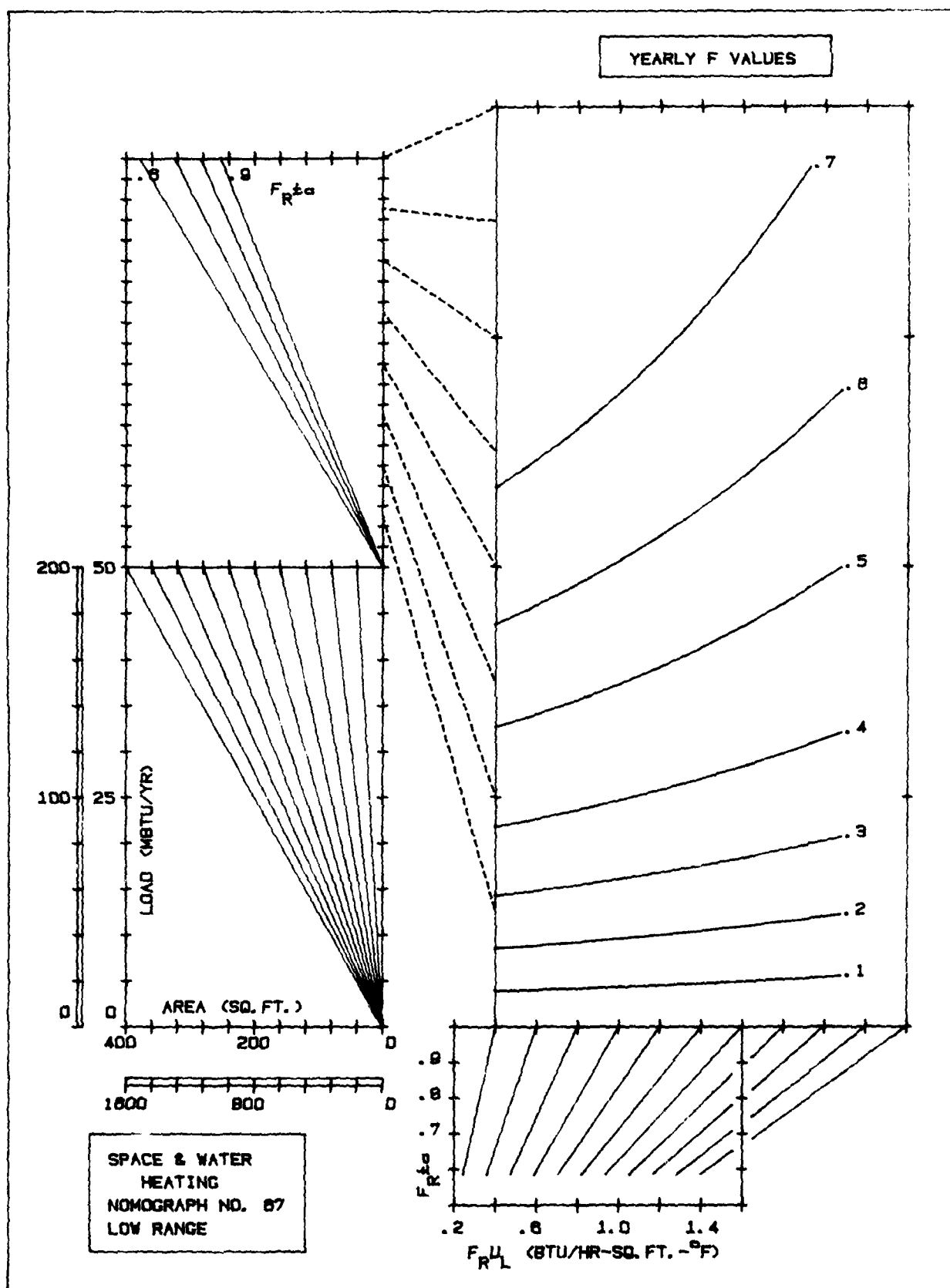




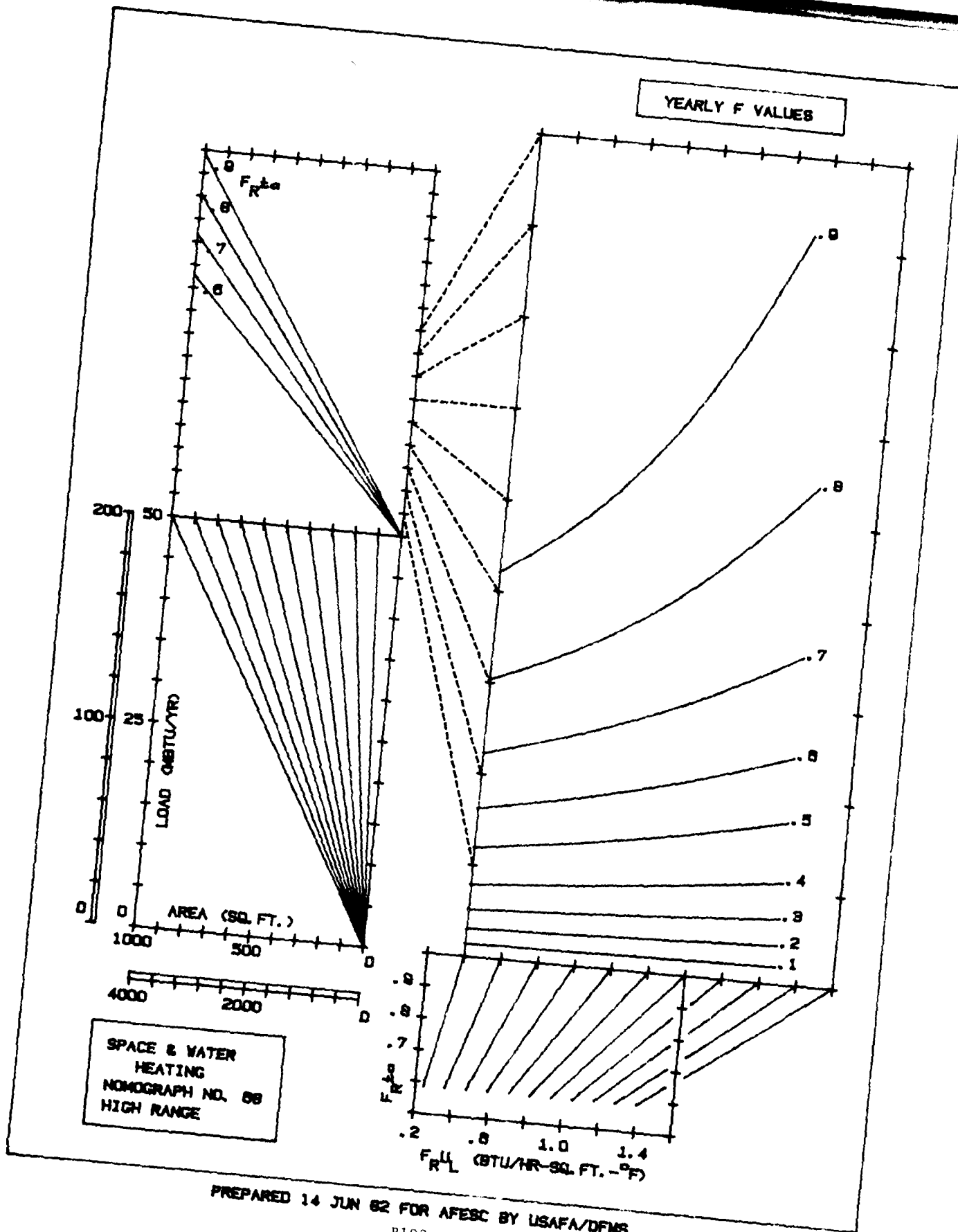


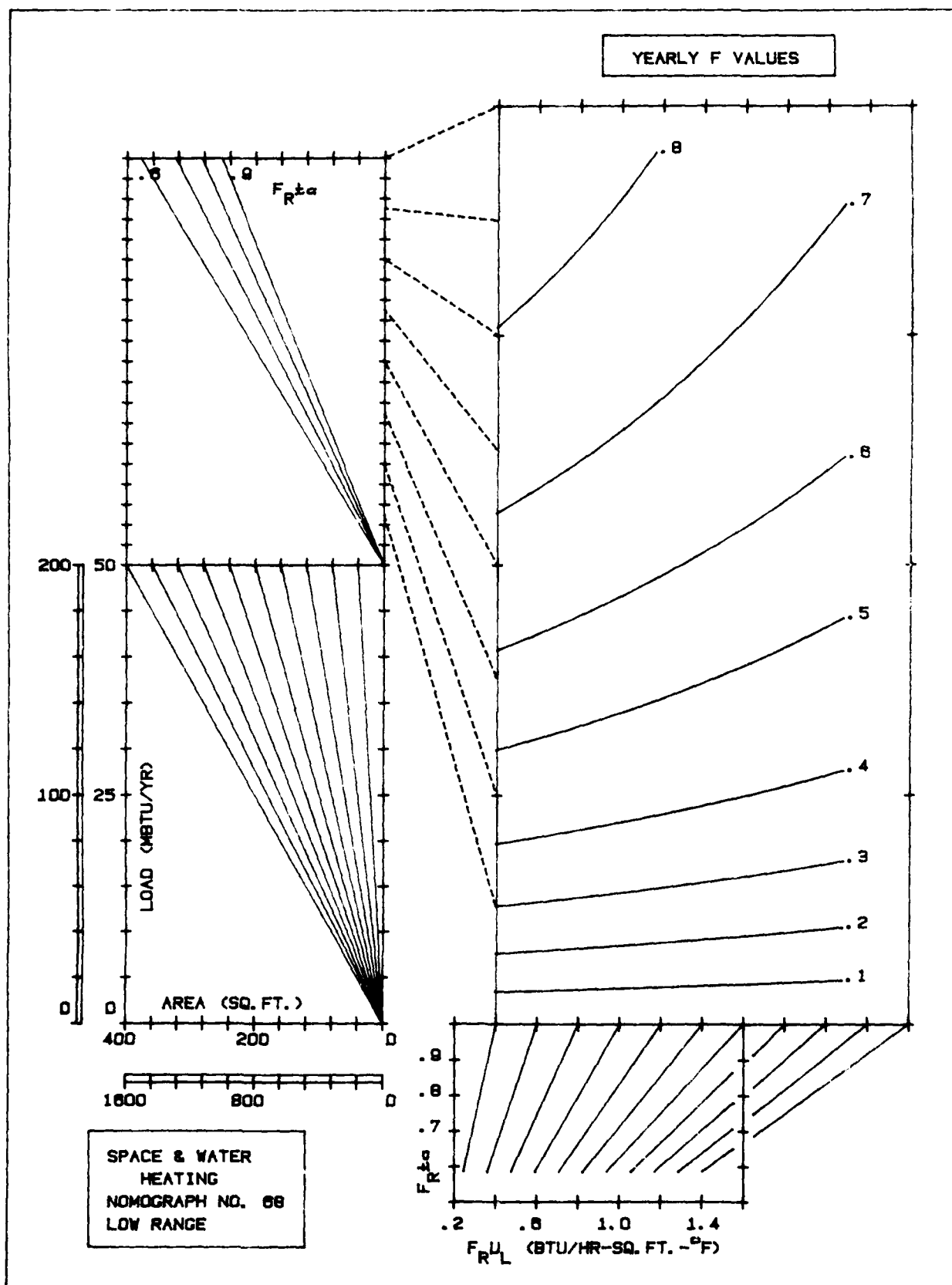


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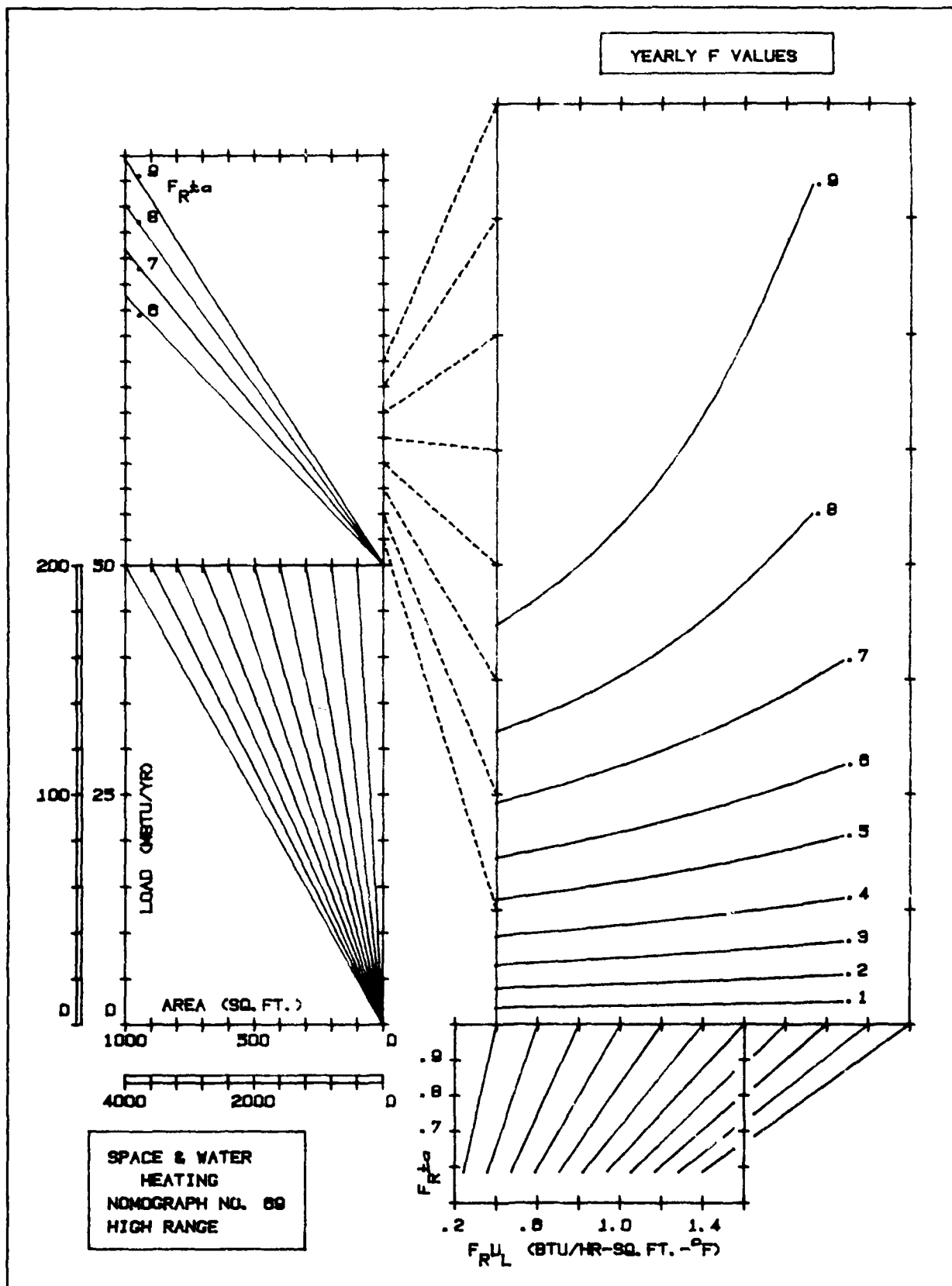


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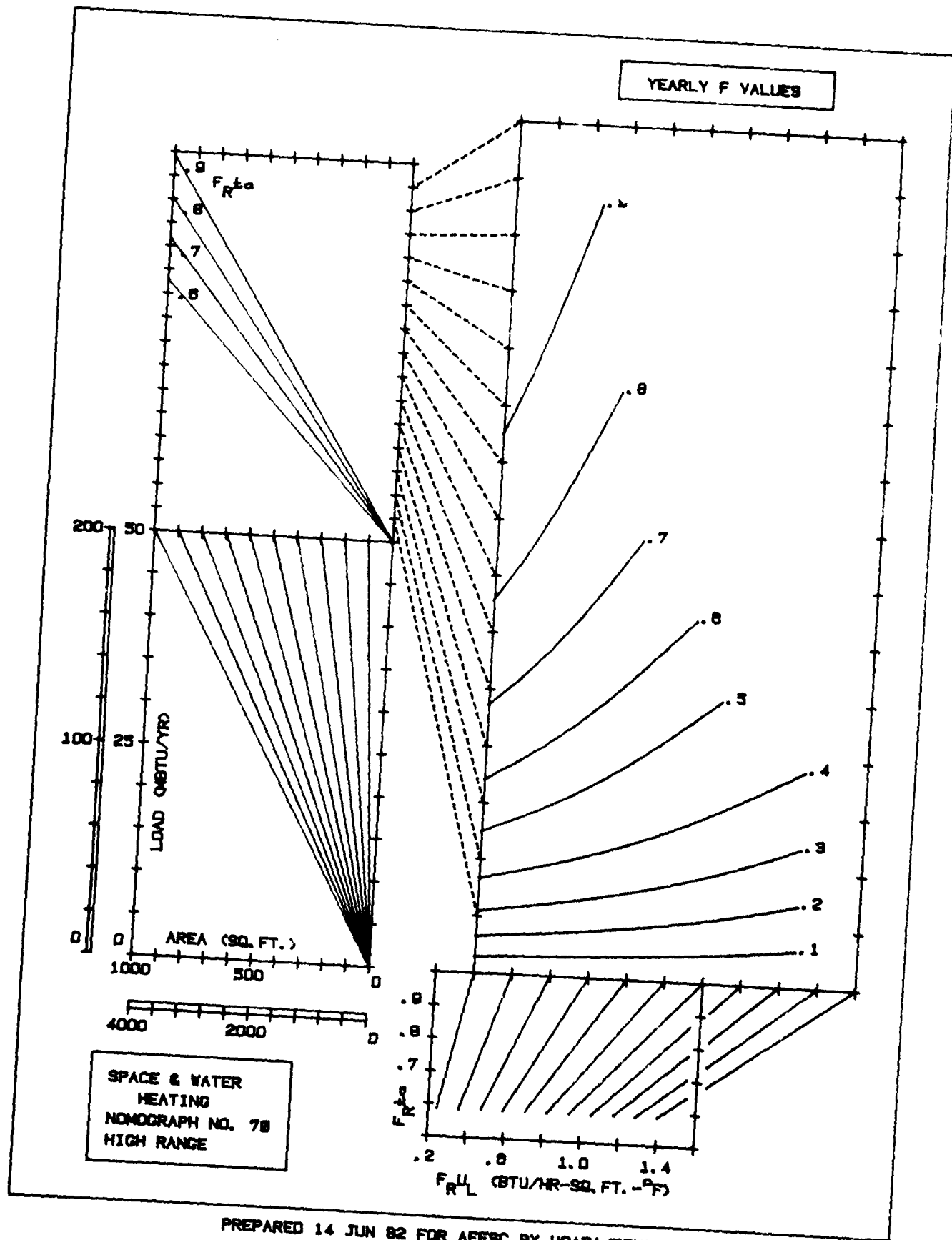


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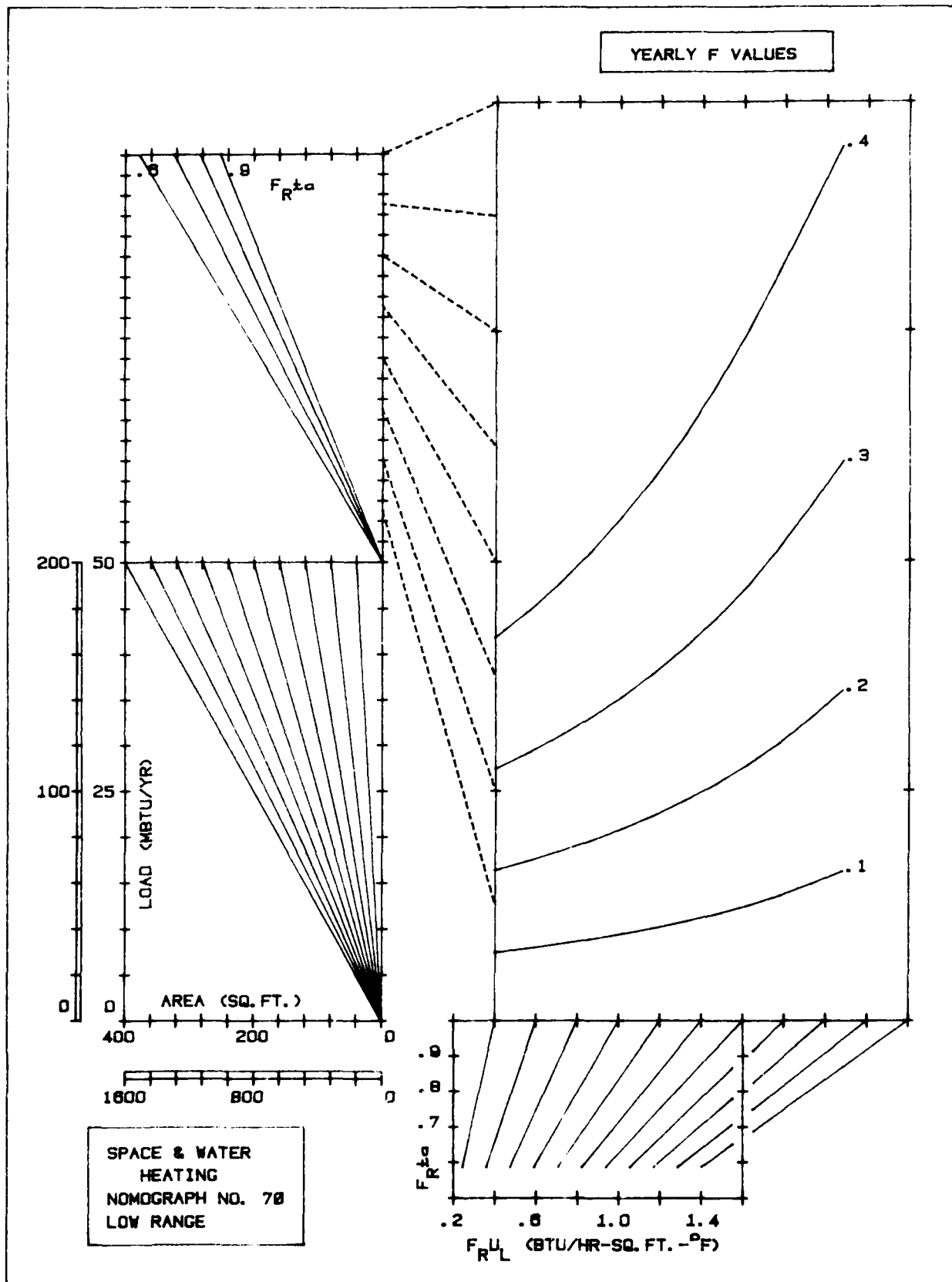
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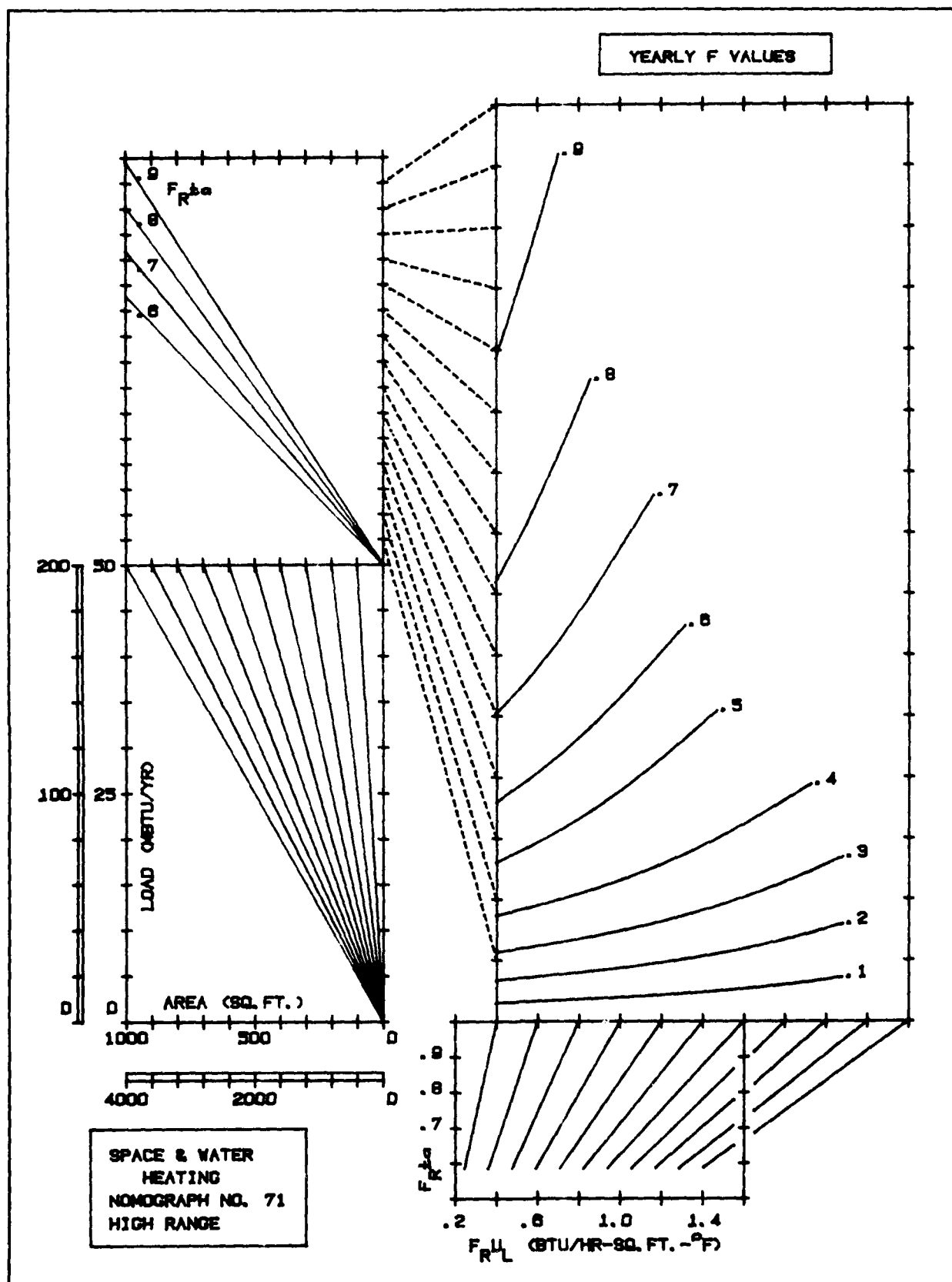
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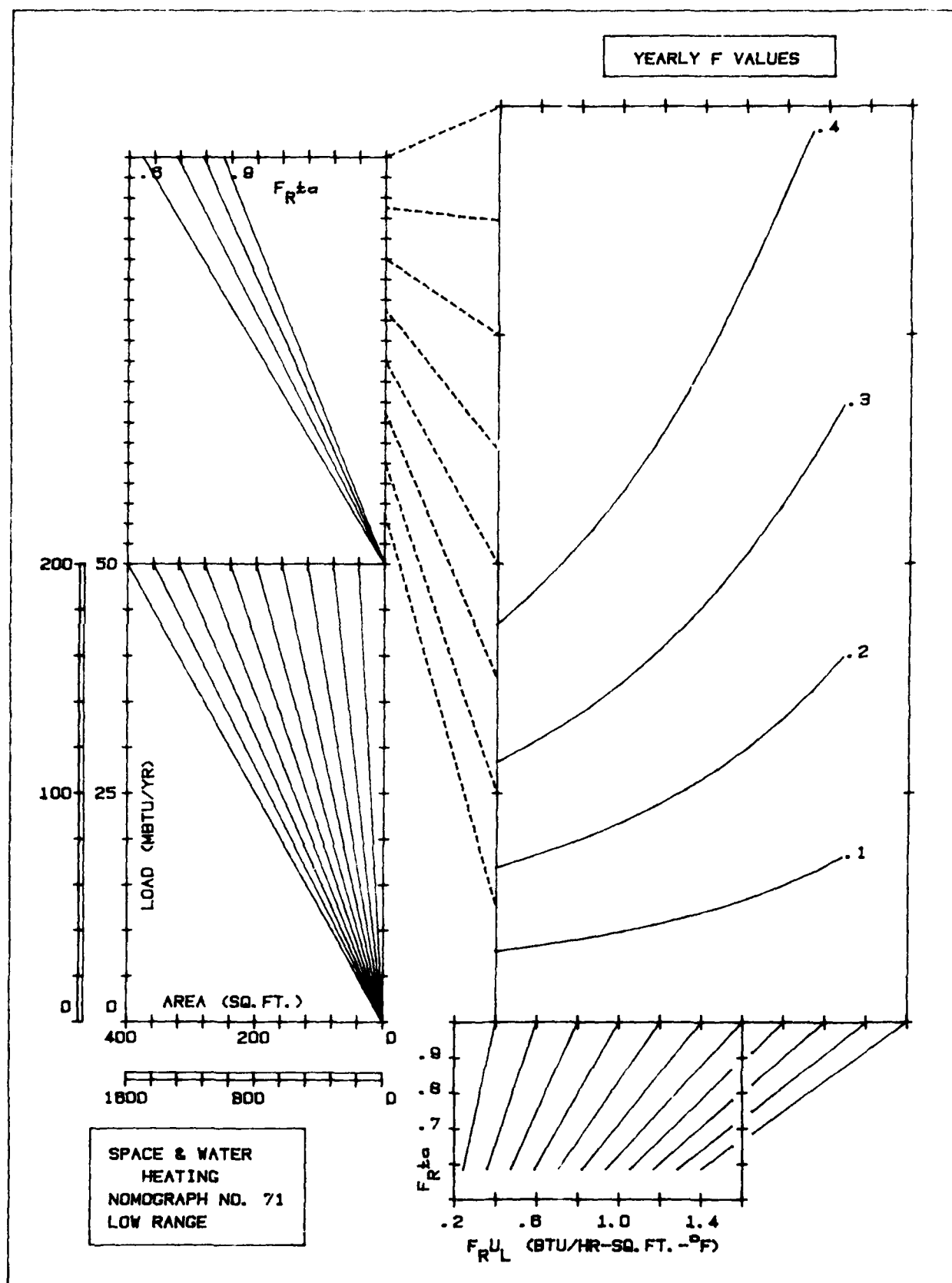


PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

B108

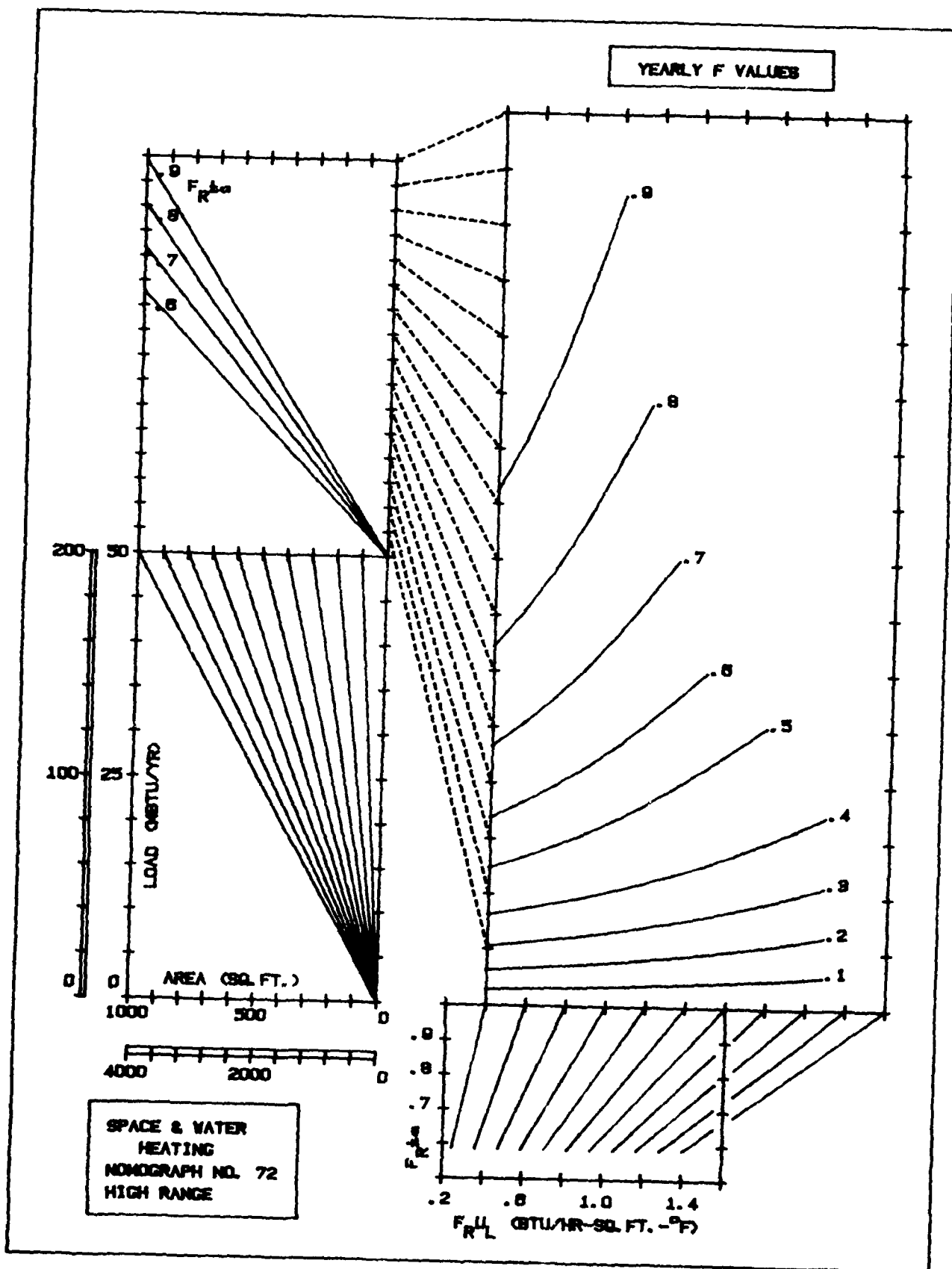


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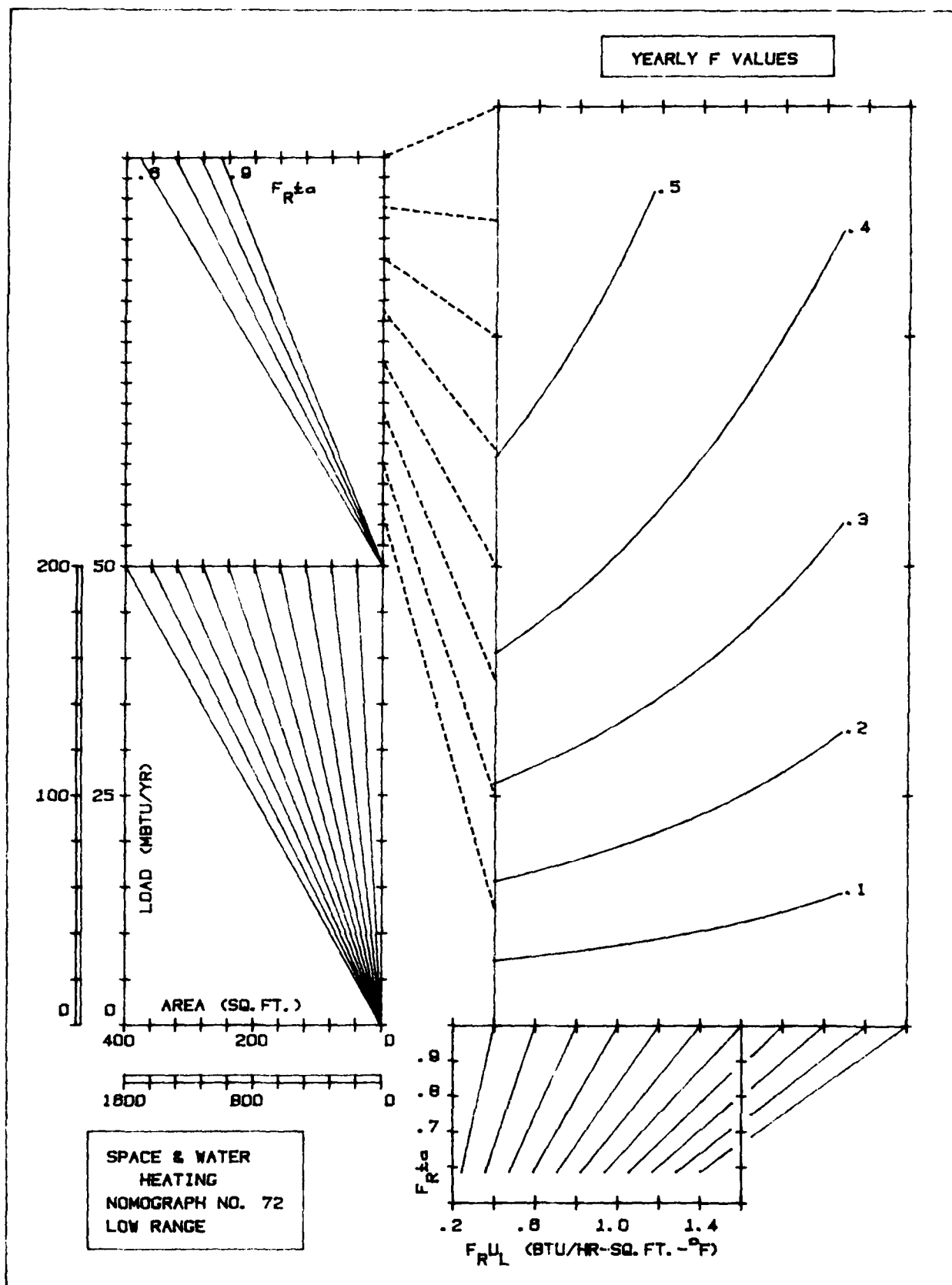


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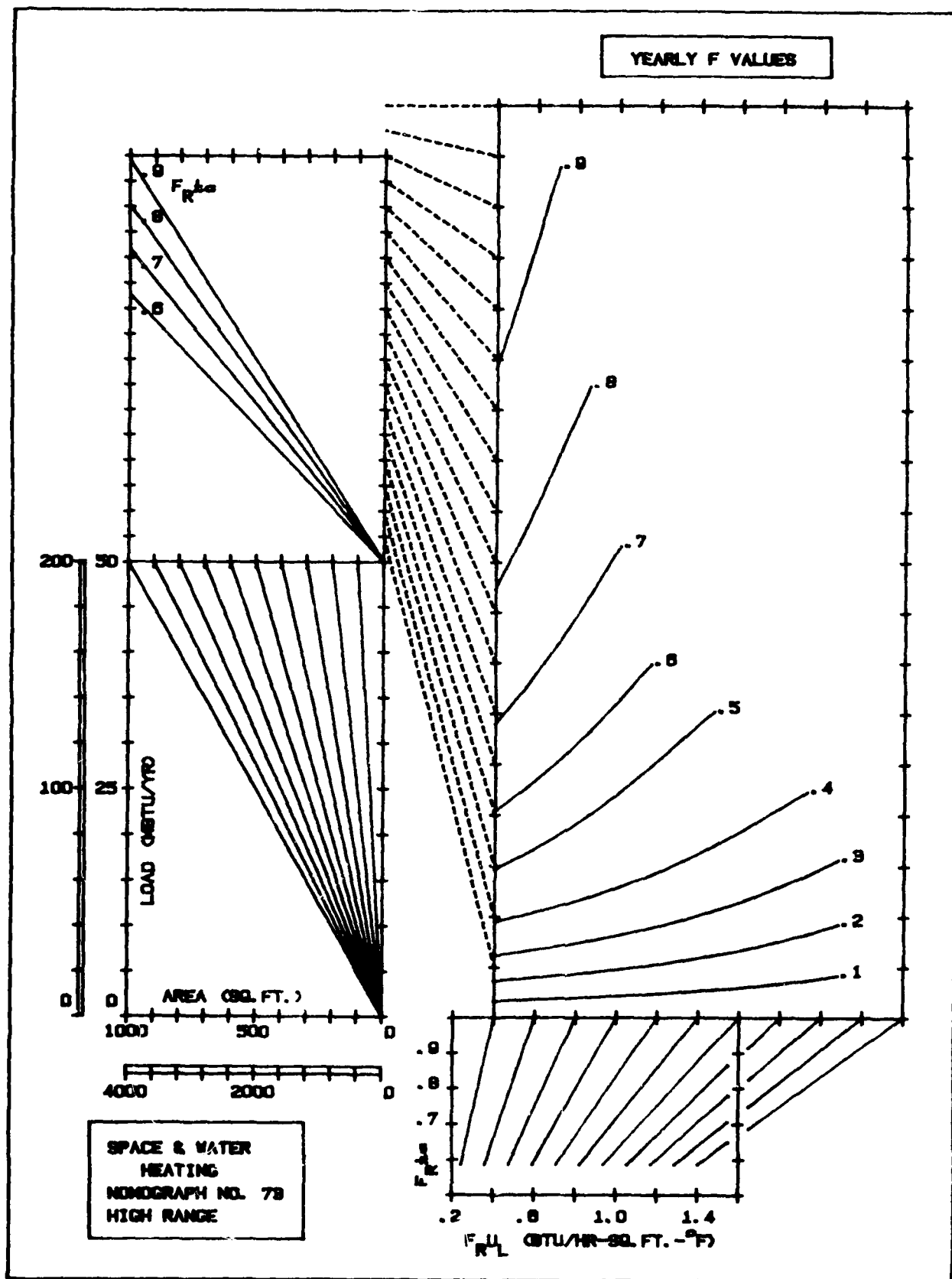
B110



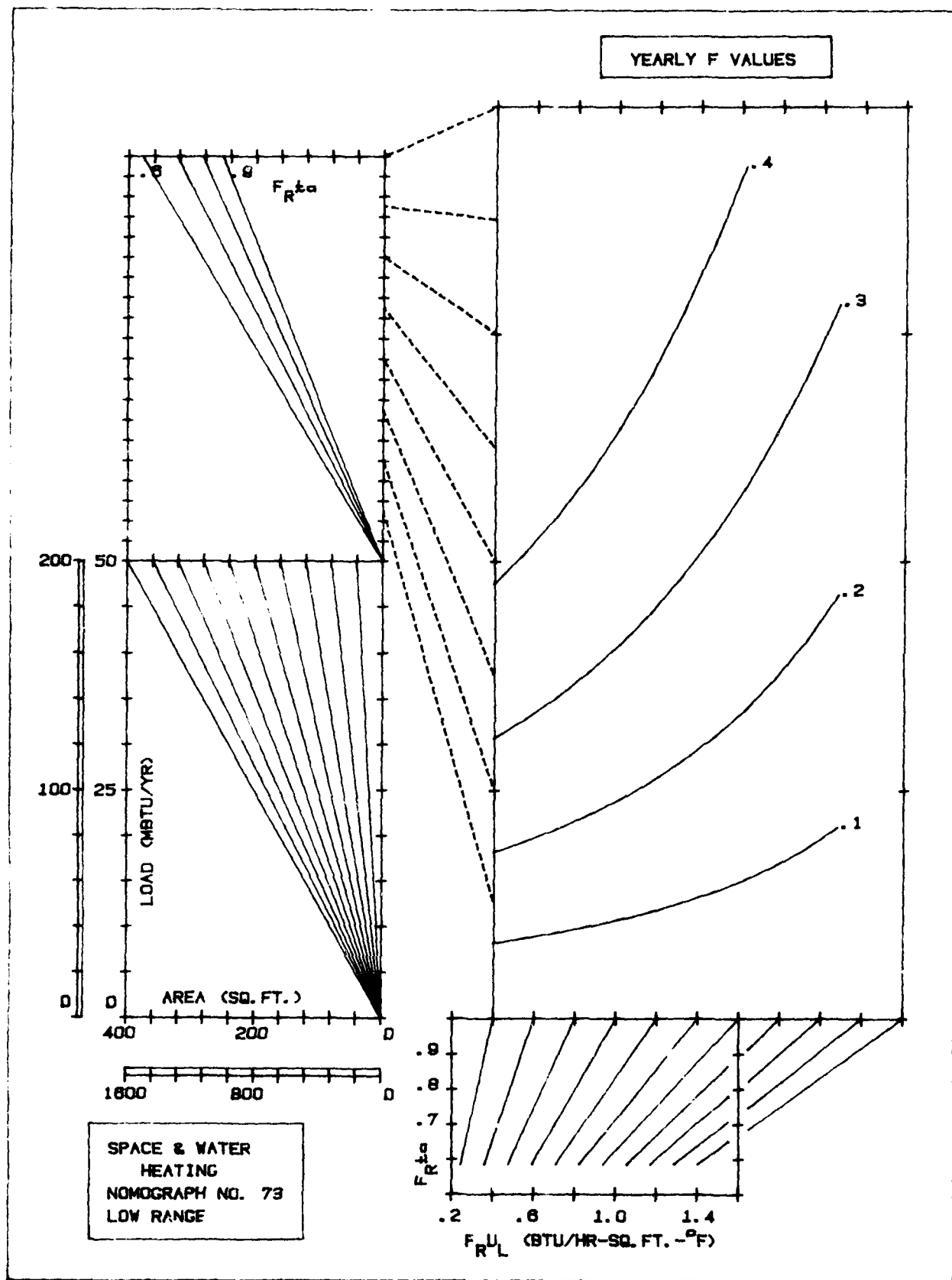
PREPARED 14 JUN 62 FOR AFESC BY USAFA/DFMS



PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

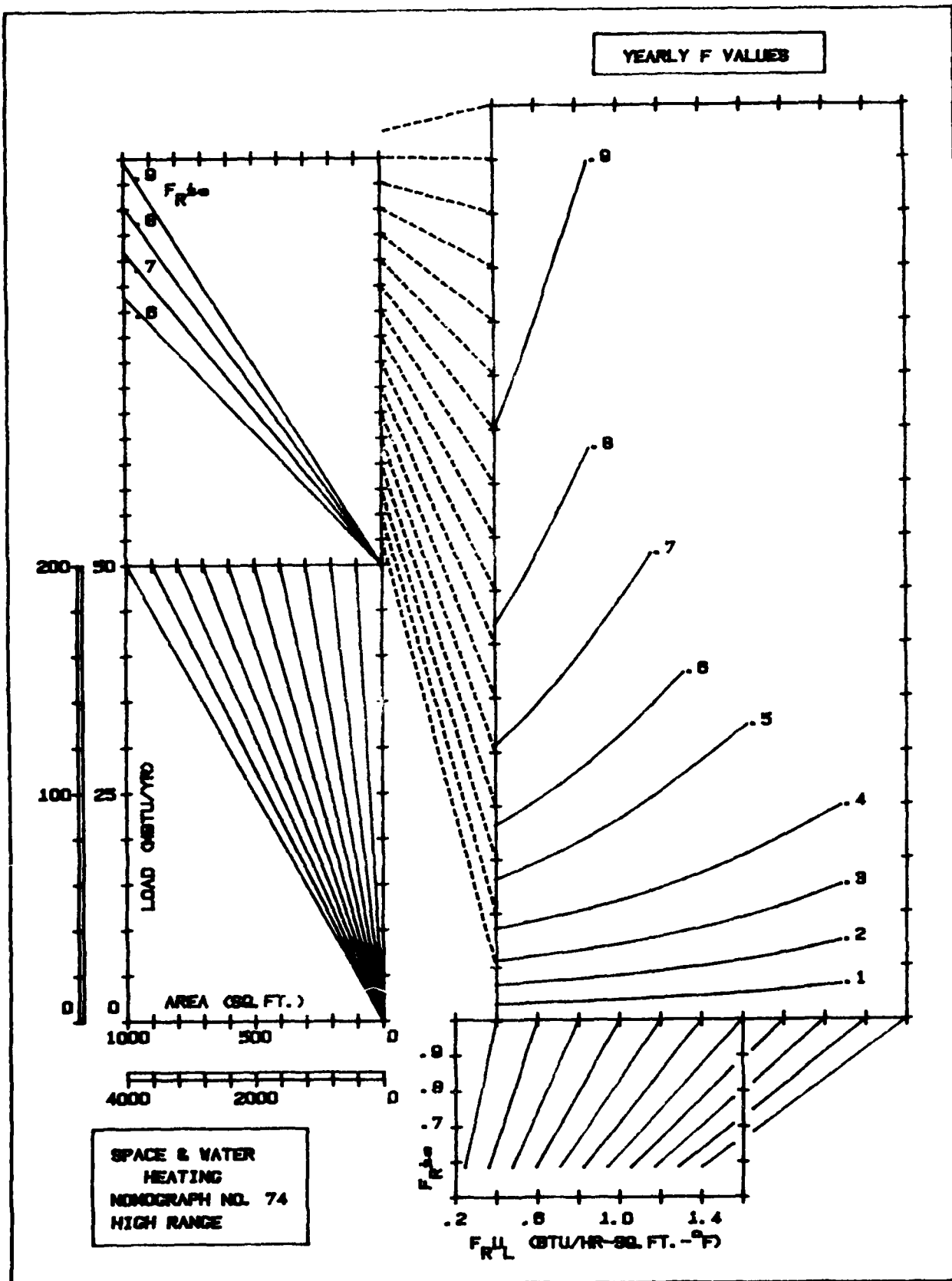


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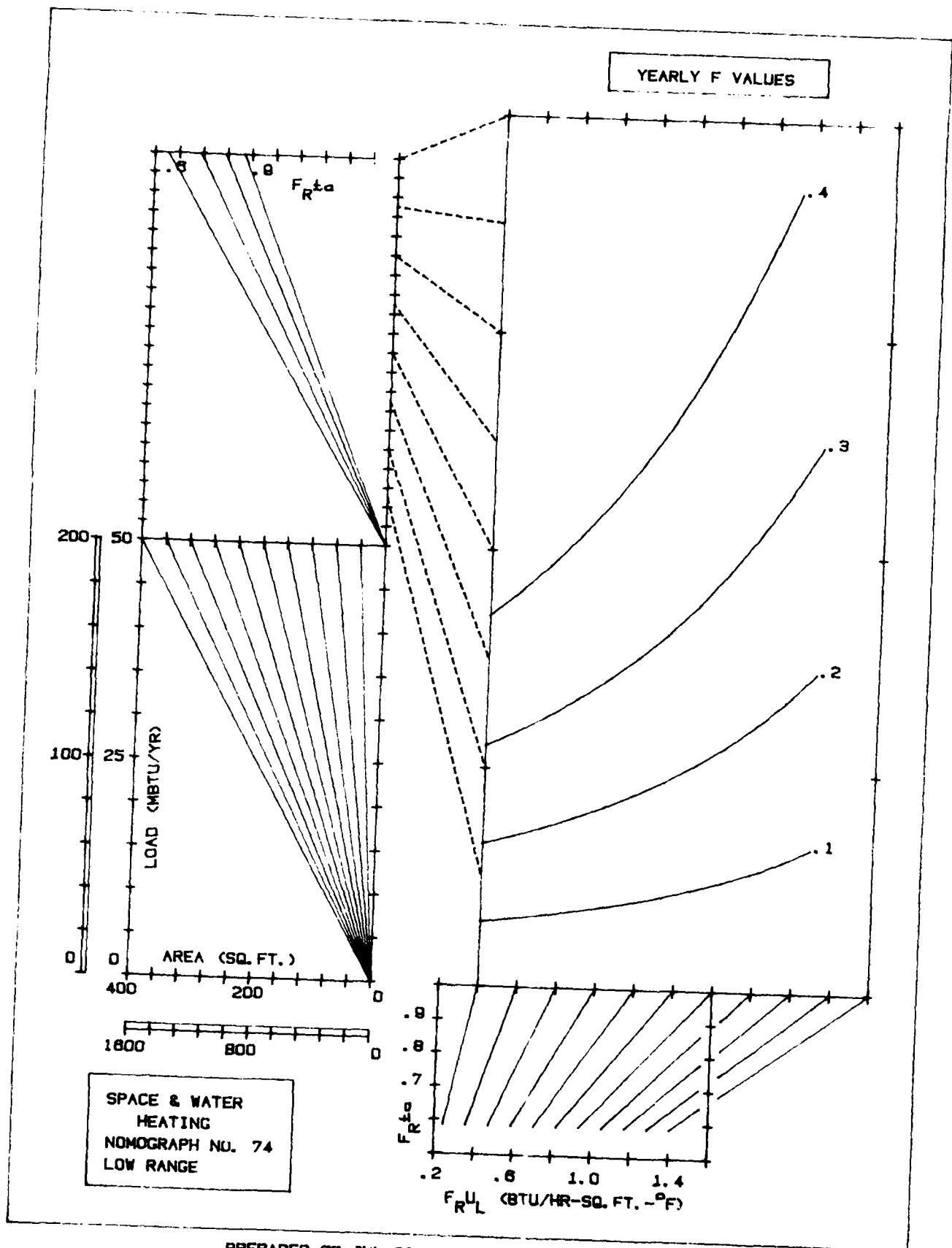
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B114



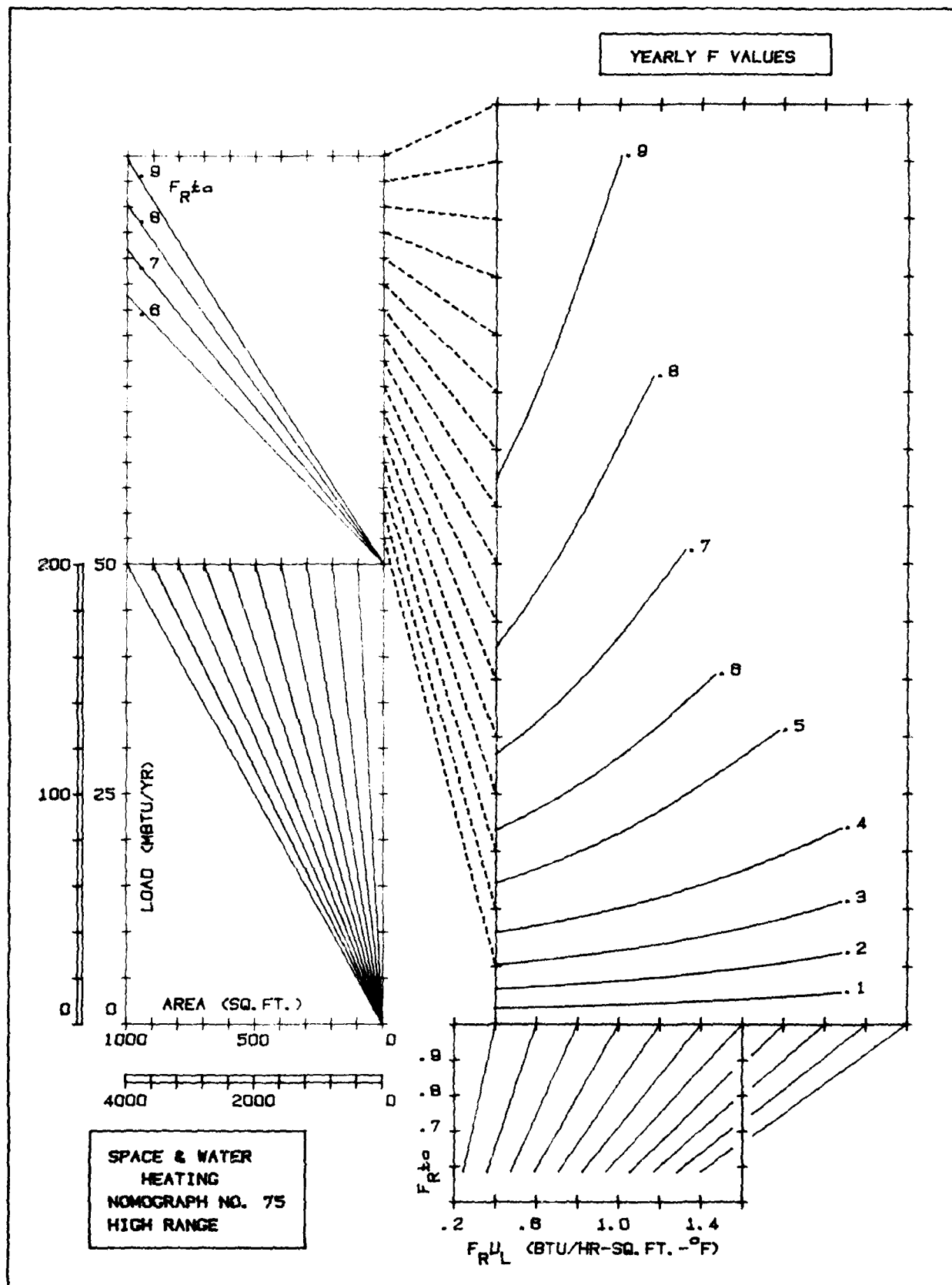
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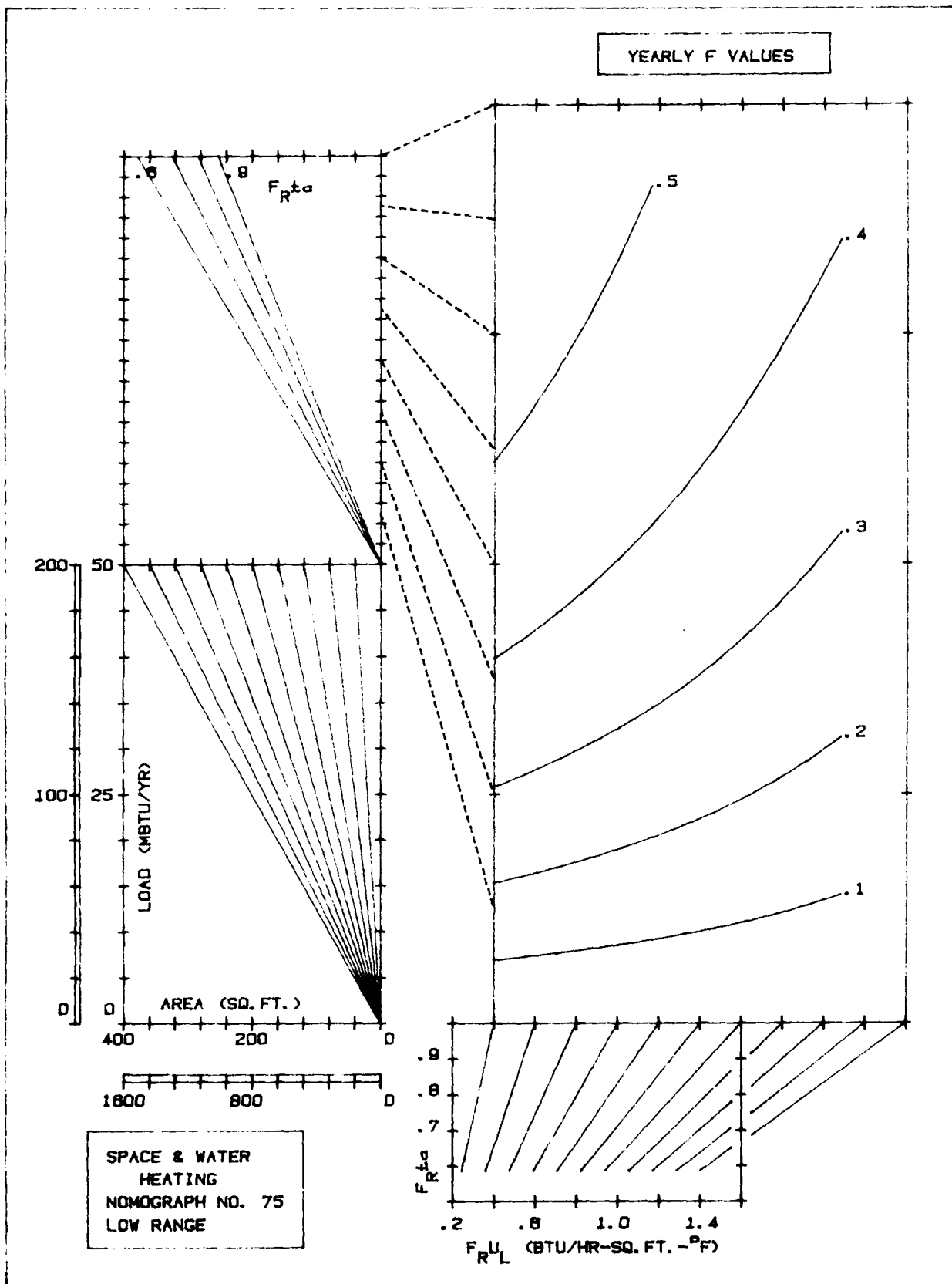


PREPARED 07 JUL 62 FOR AFESC BY USAFA/DFMS

B116



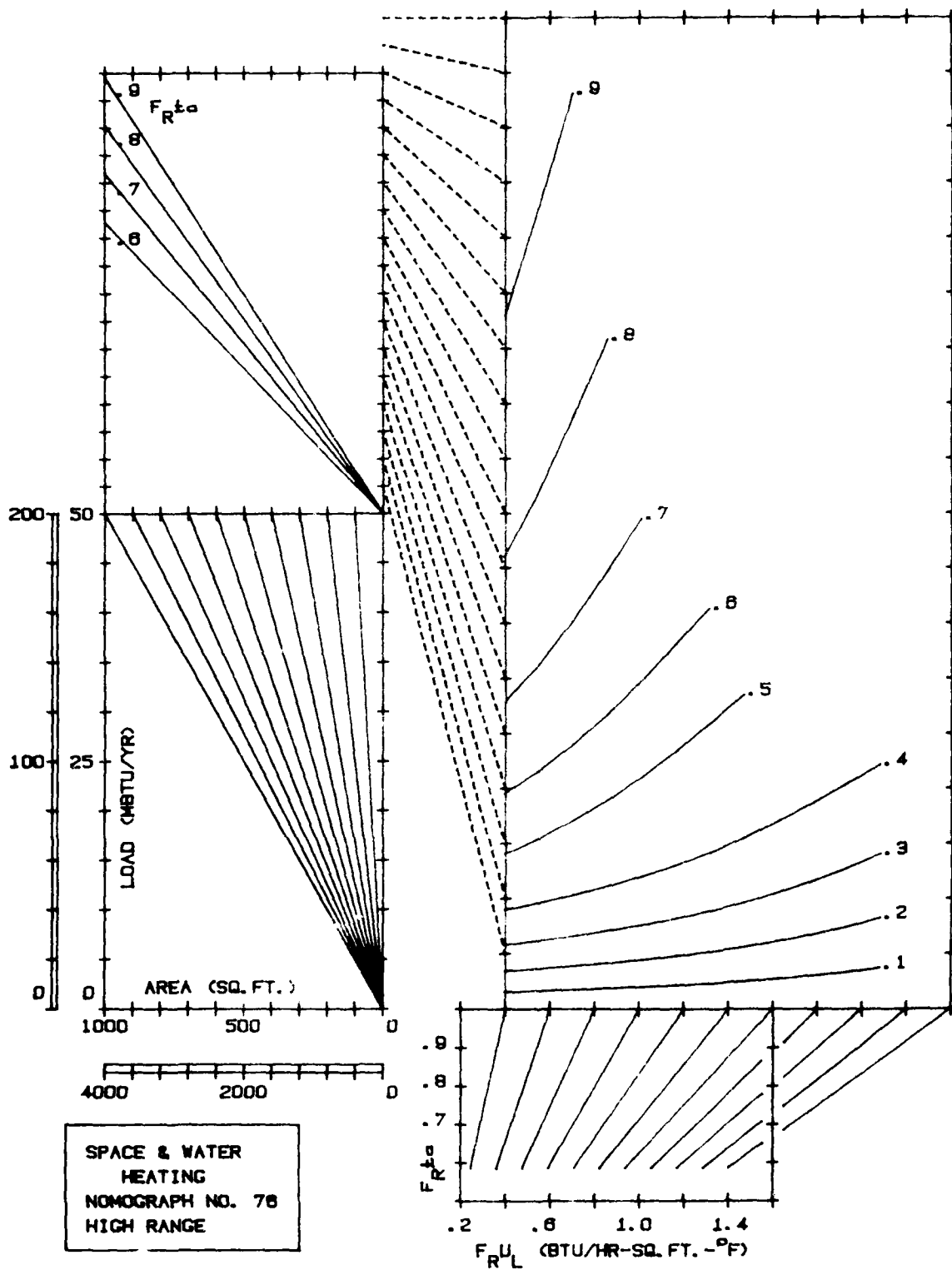
PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS



PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

R118

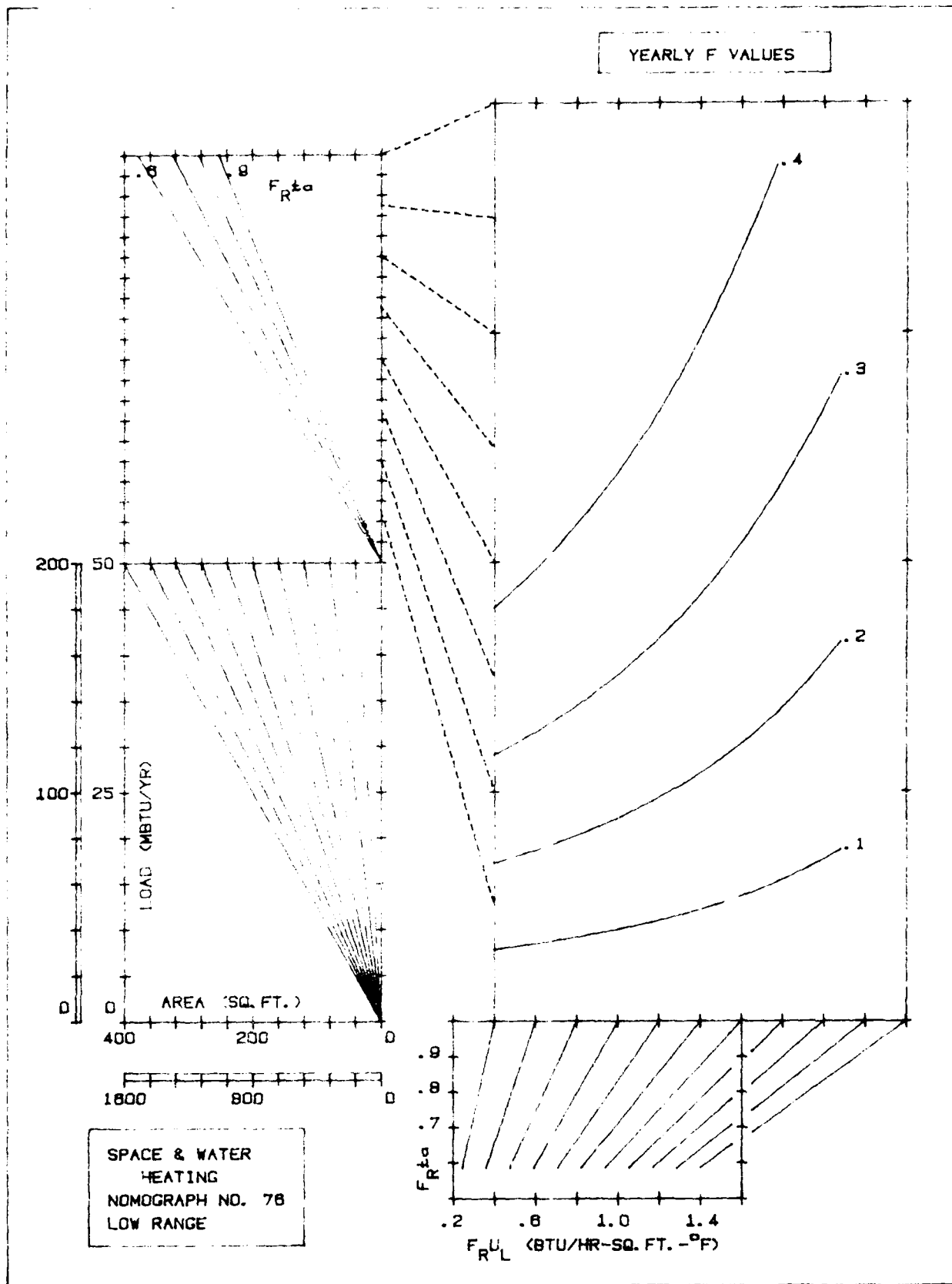
YEARLY F VALUES



SPACE & WATER  
HEATING  
NOMOGRAPH NO. 76  
HIGH RANGE

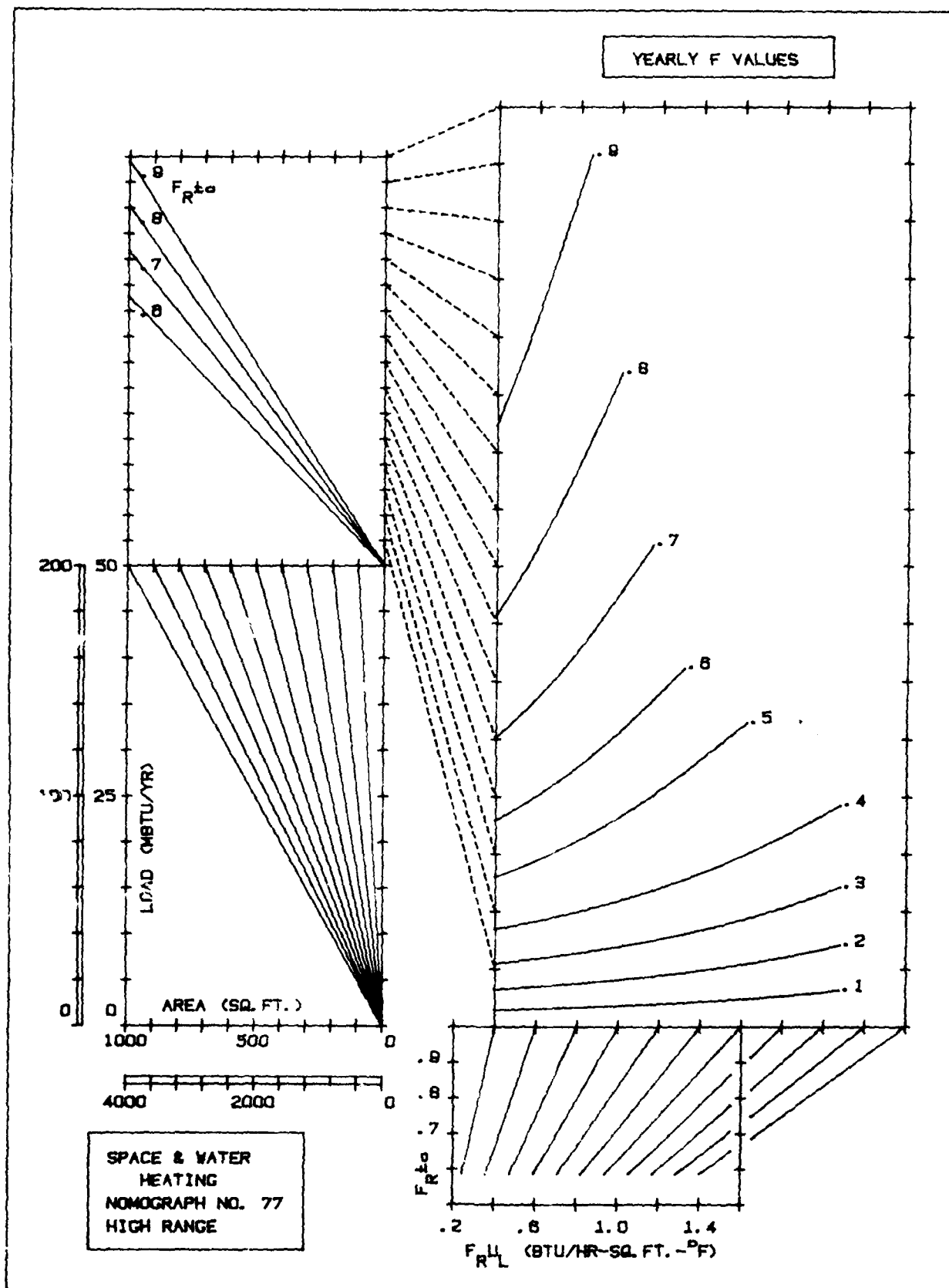
PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS

B119

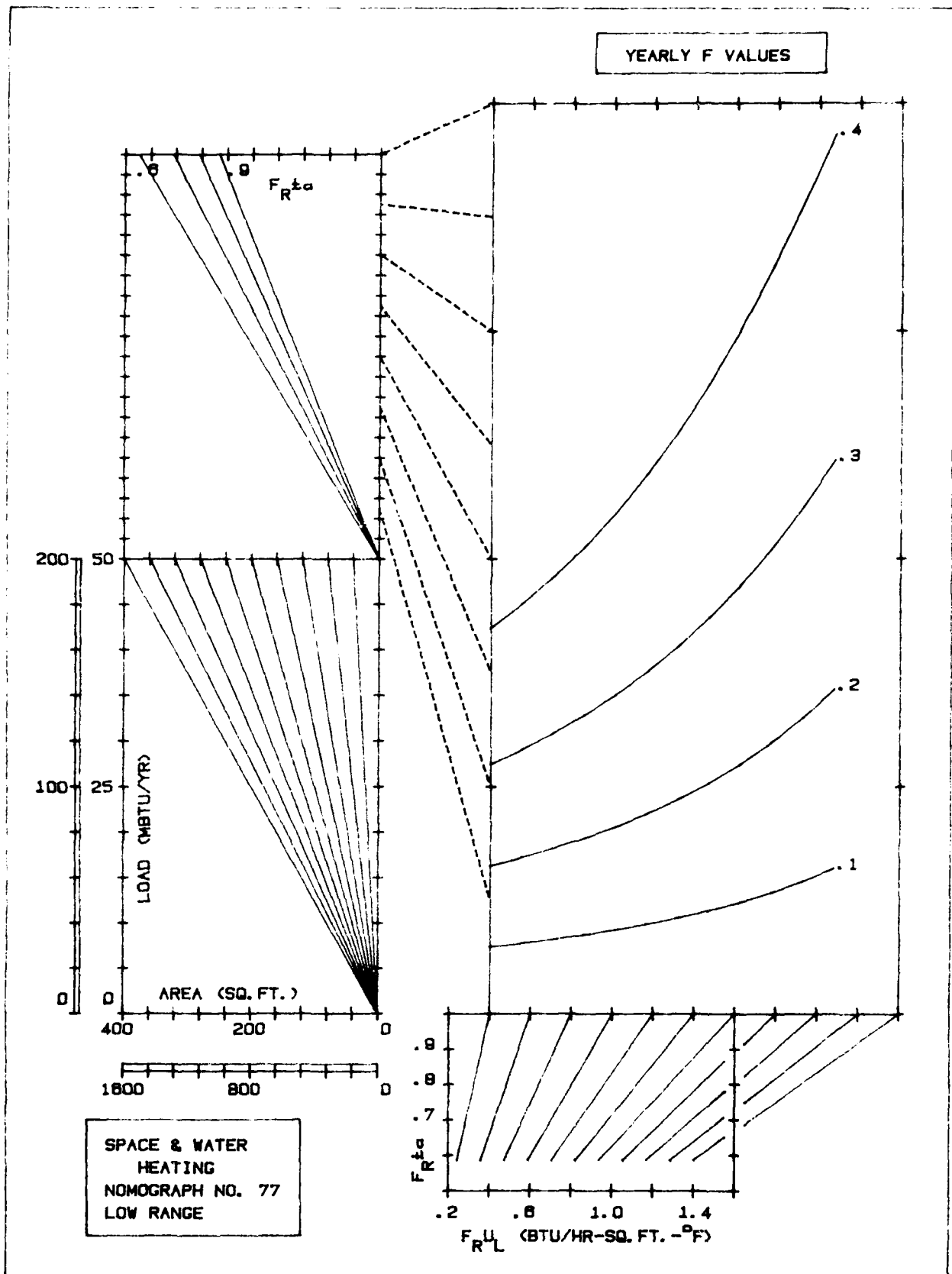


PREPARED 06 JUL 82 FOR AFESC BY USAFA/DFMS

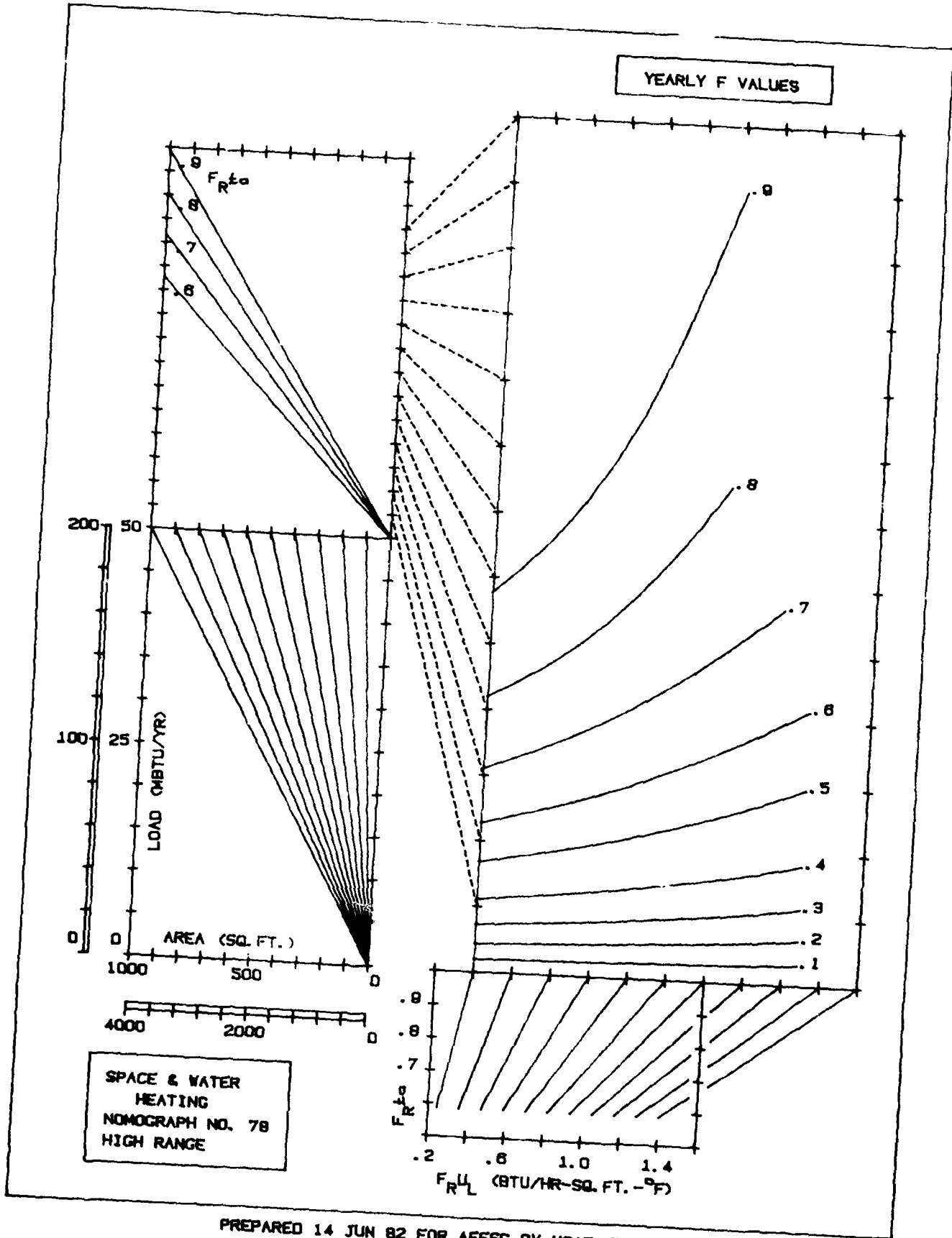
B120



PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS

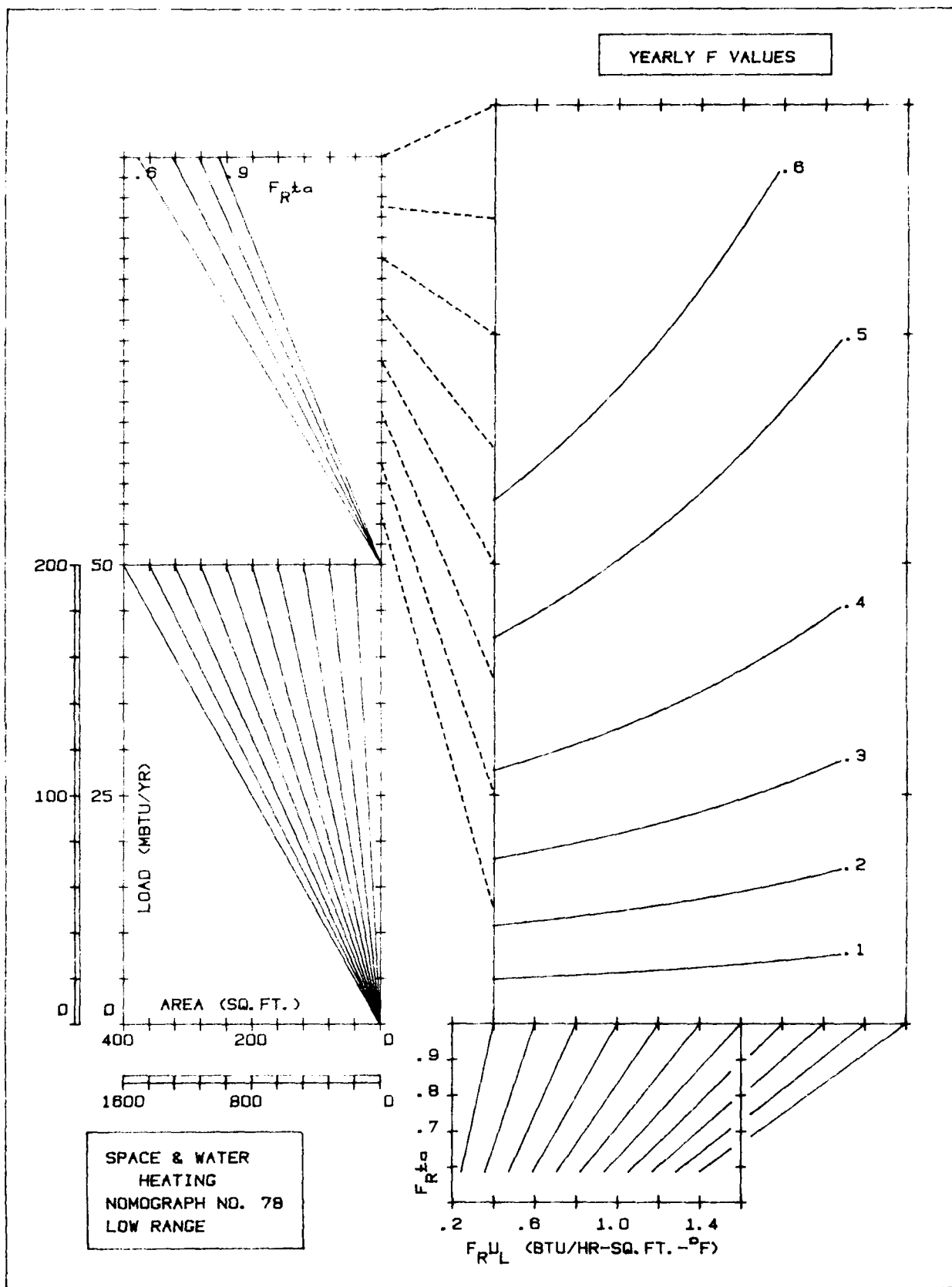


PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS



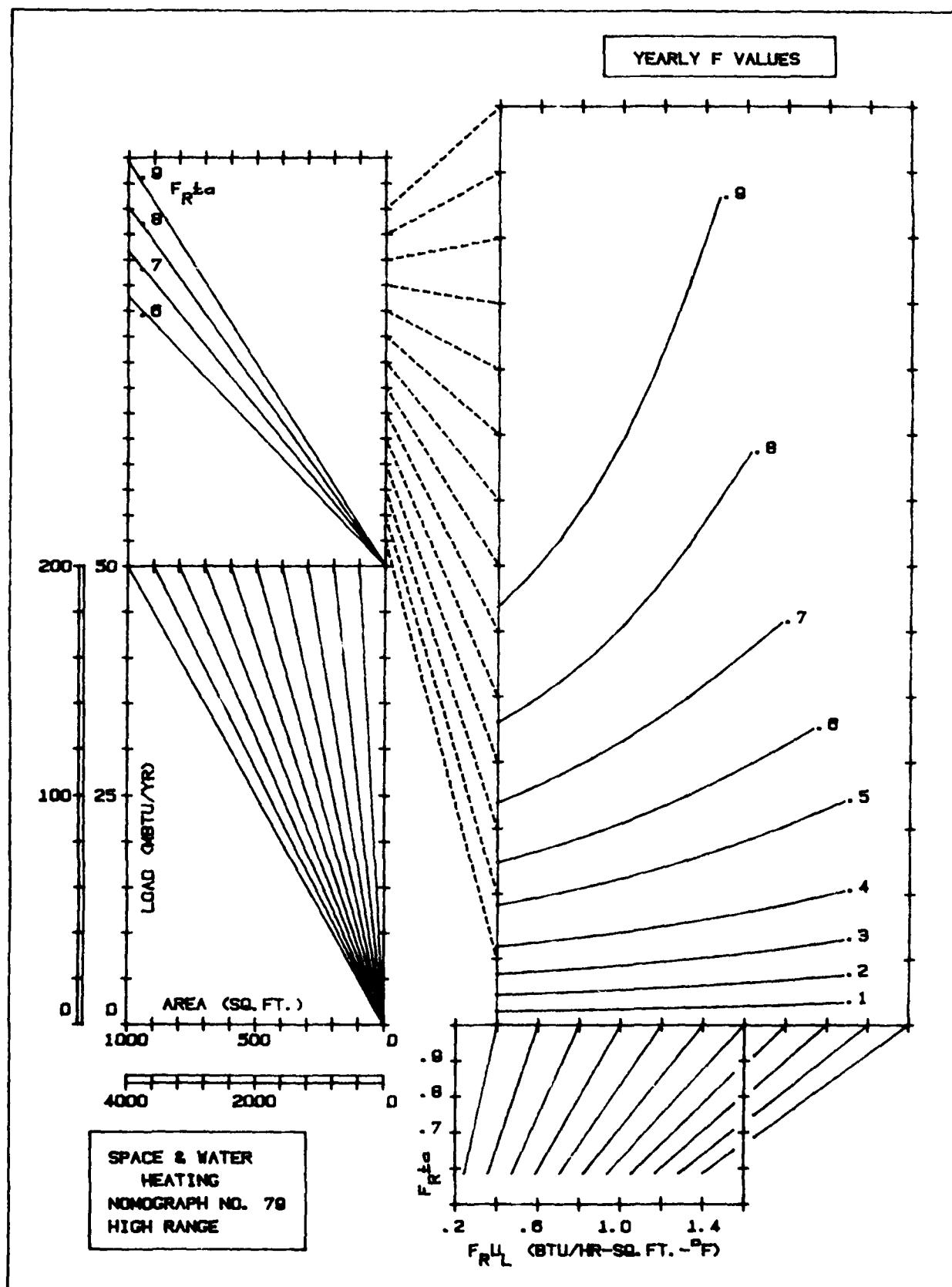
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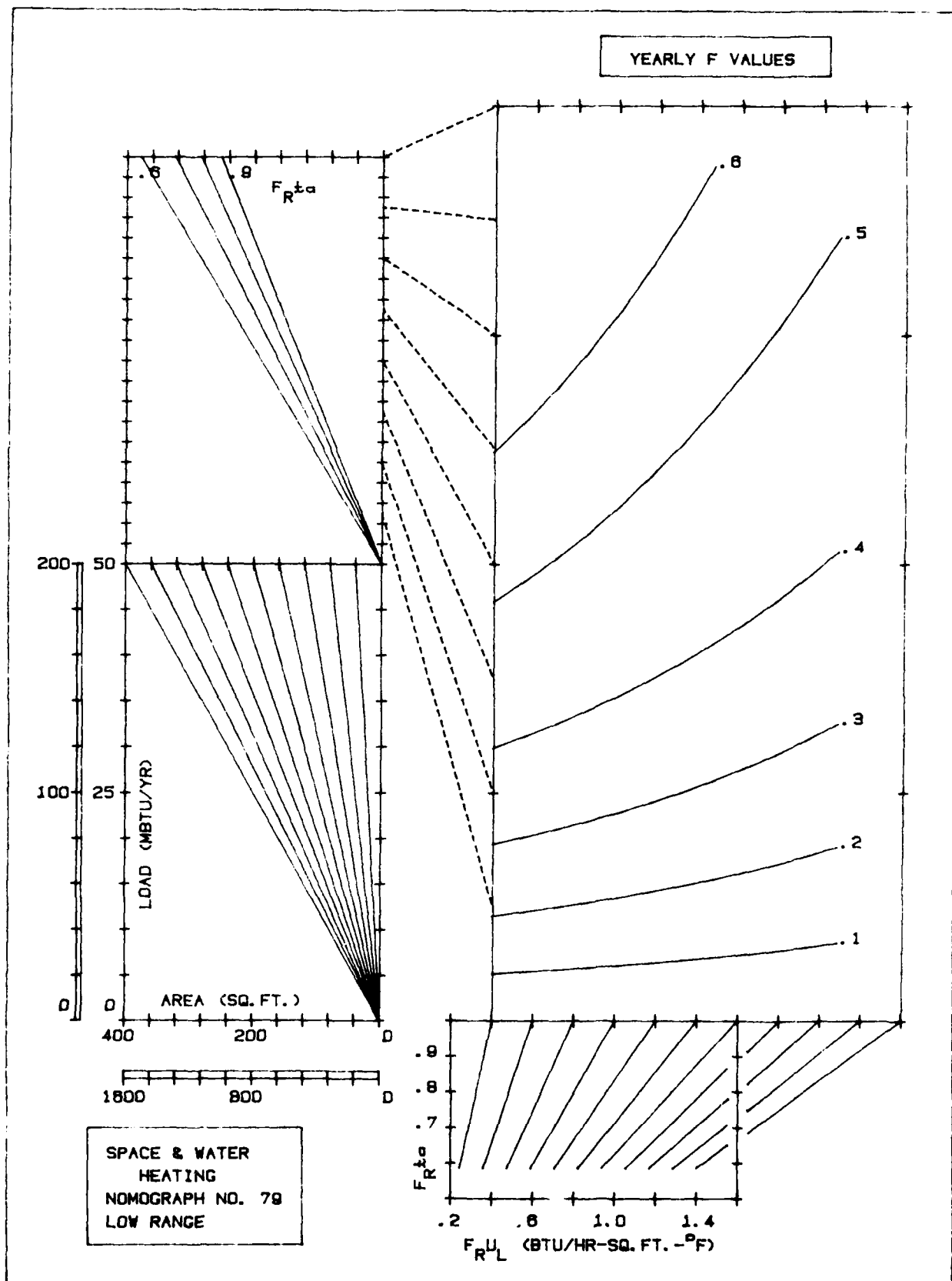


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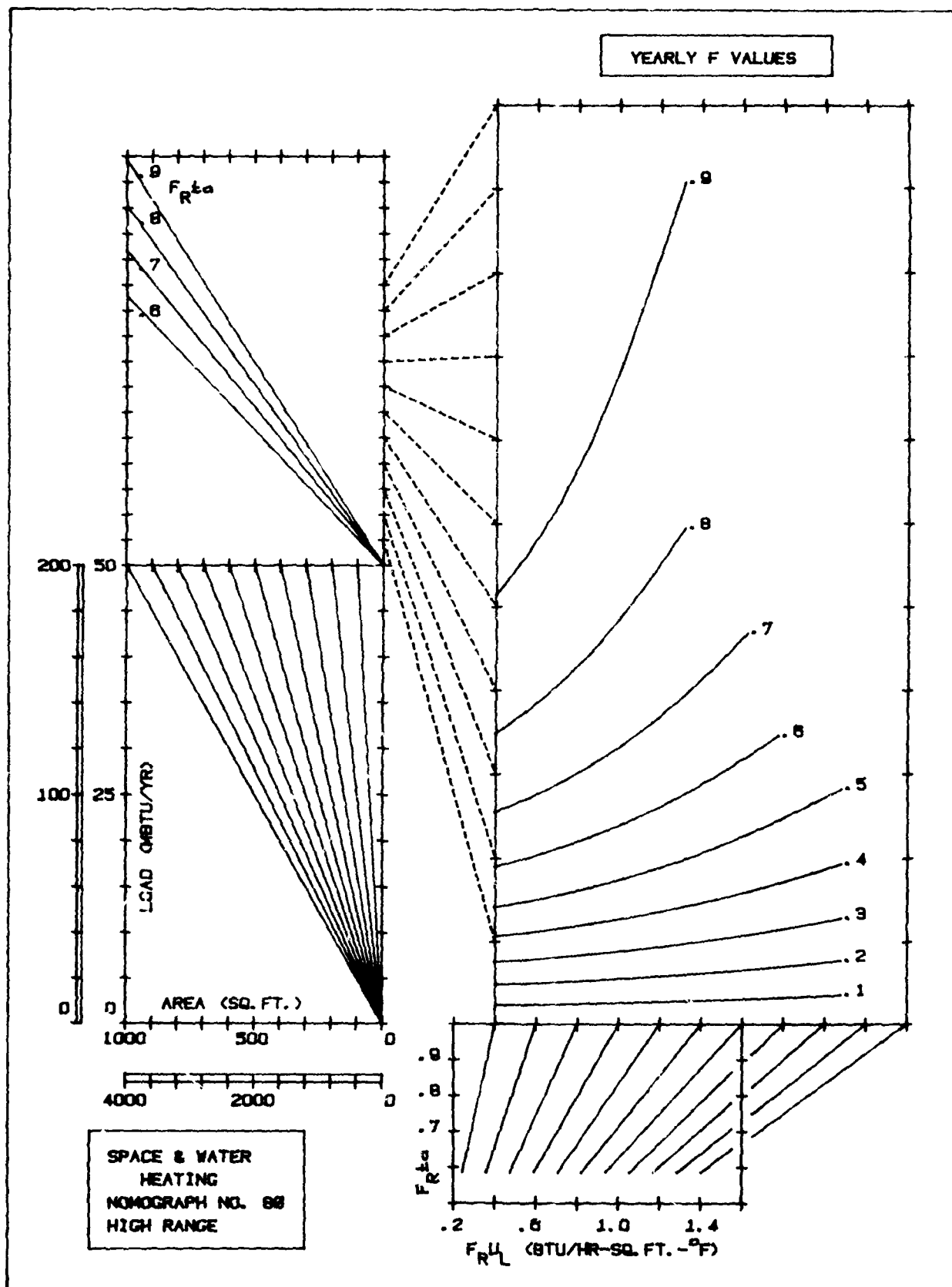
B124



PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS

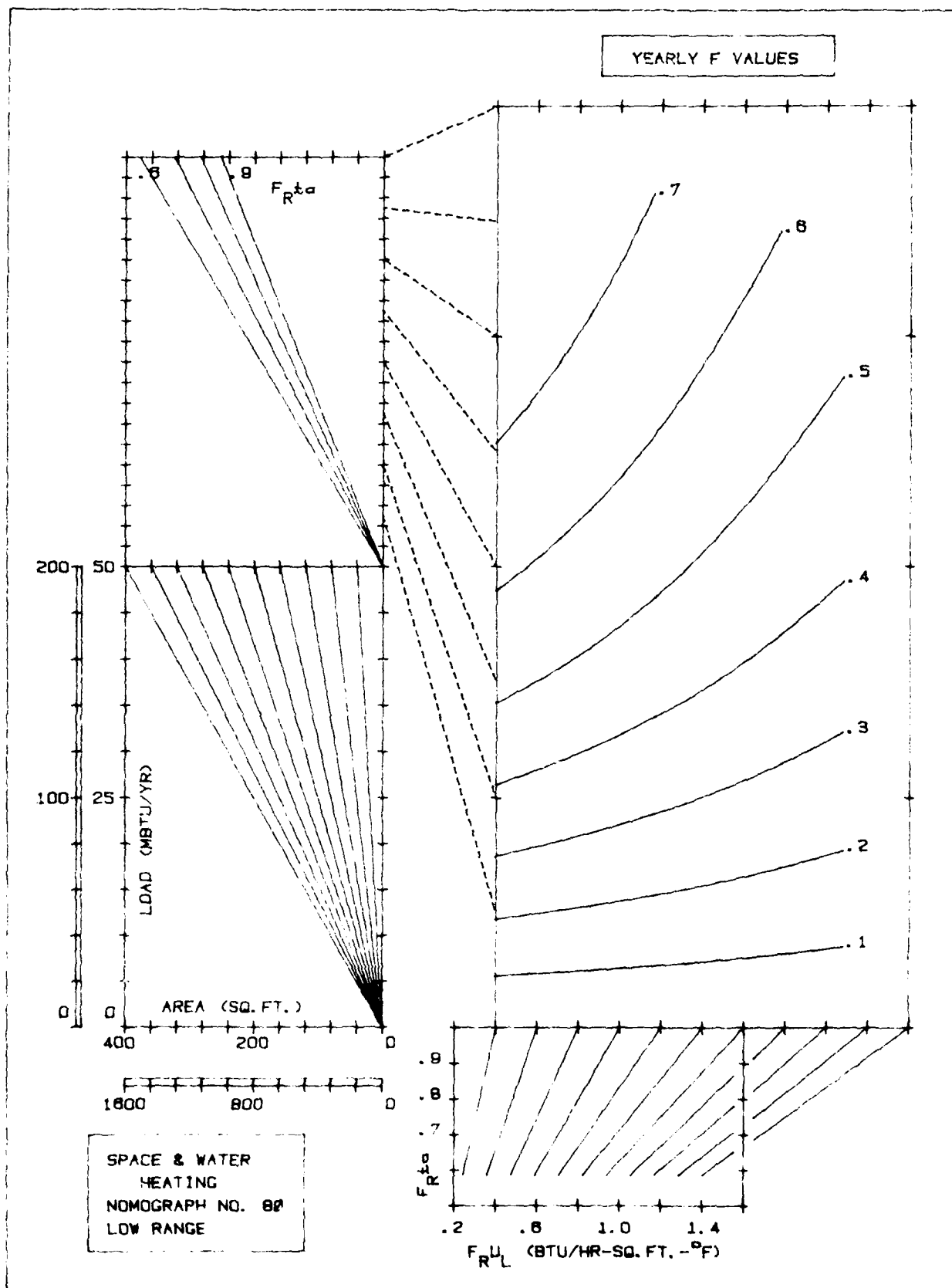


PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS



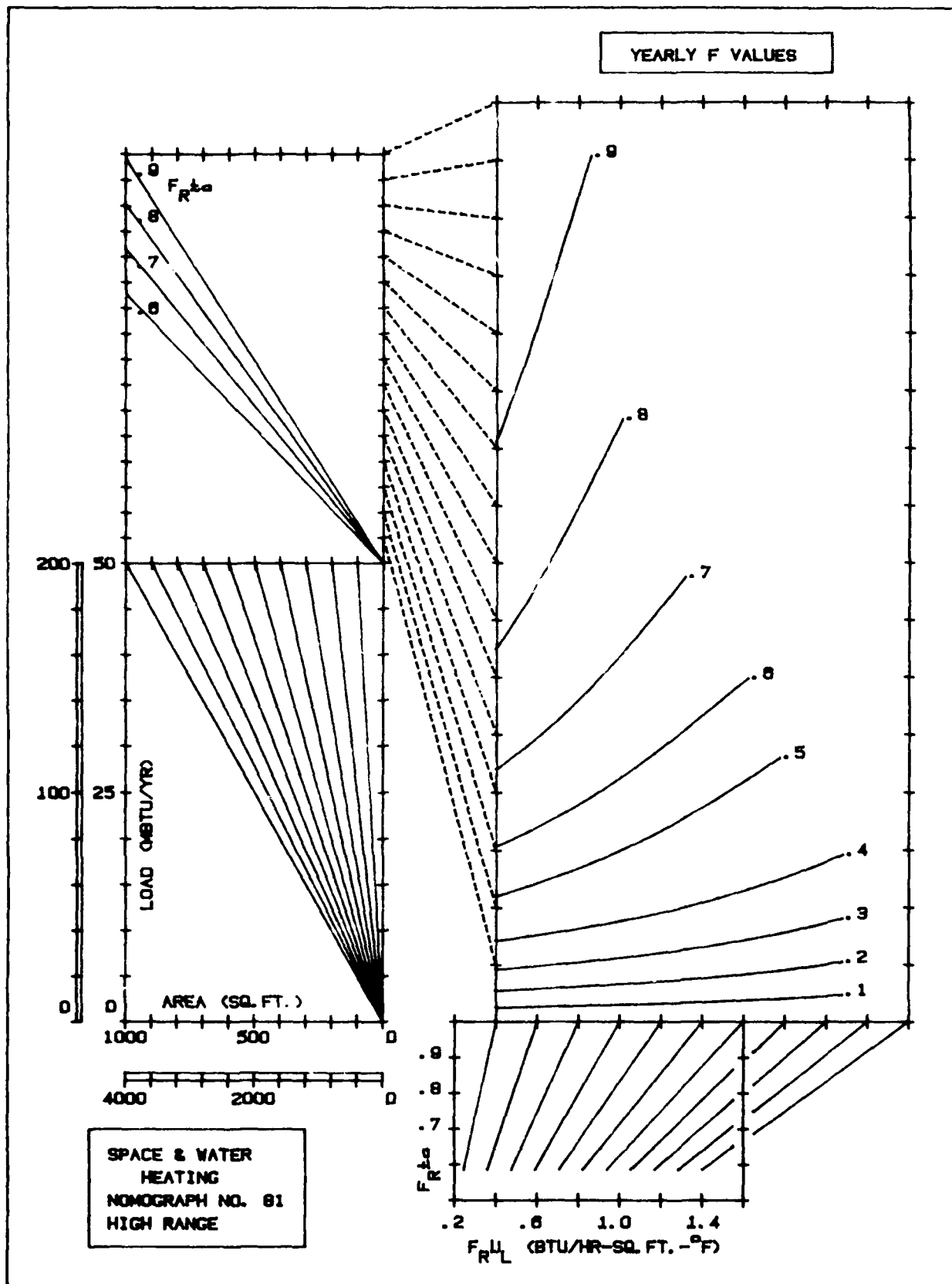
PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS

8127

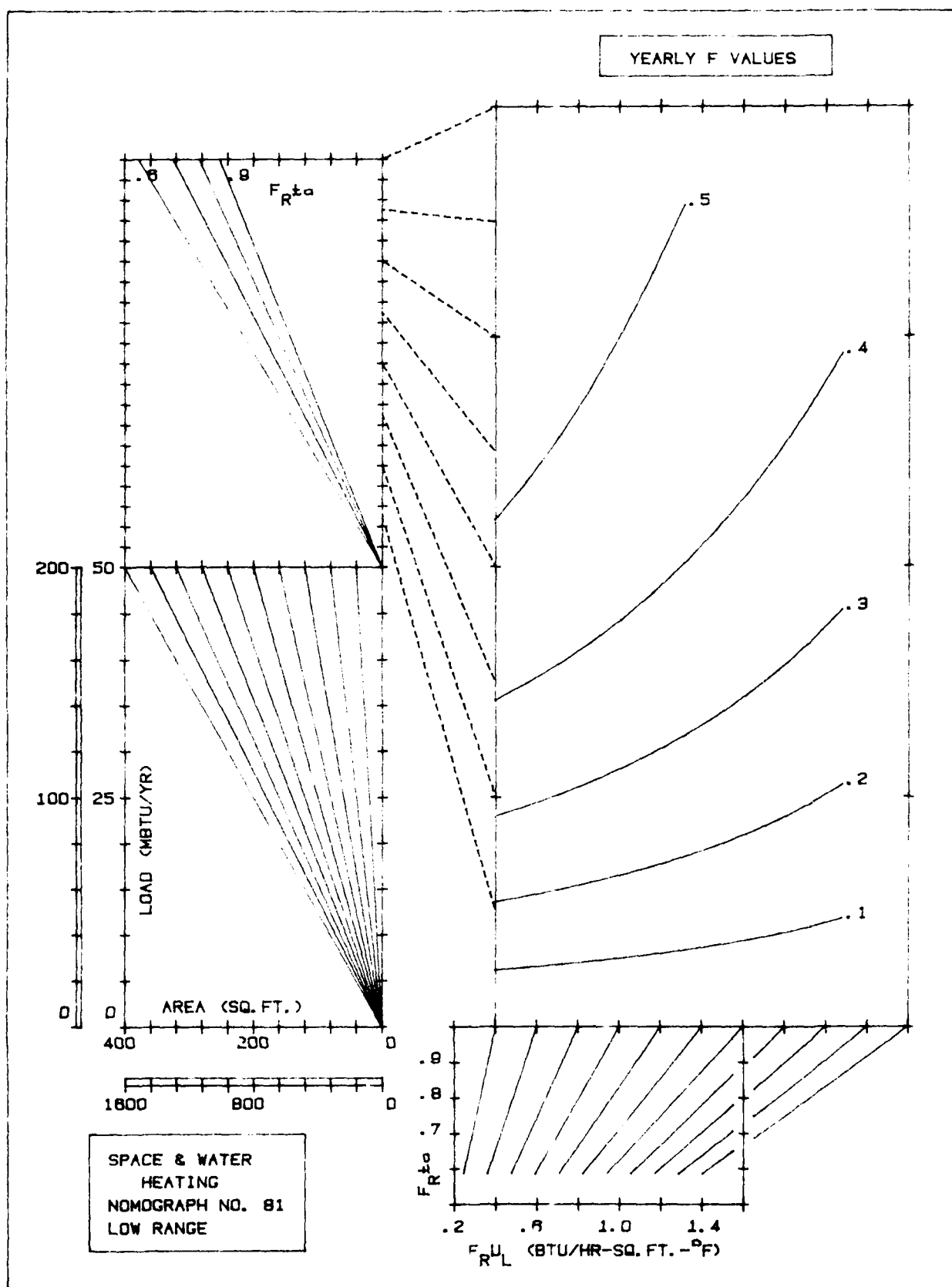


PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

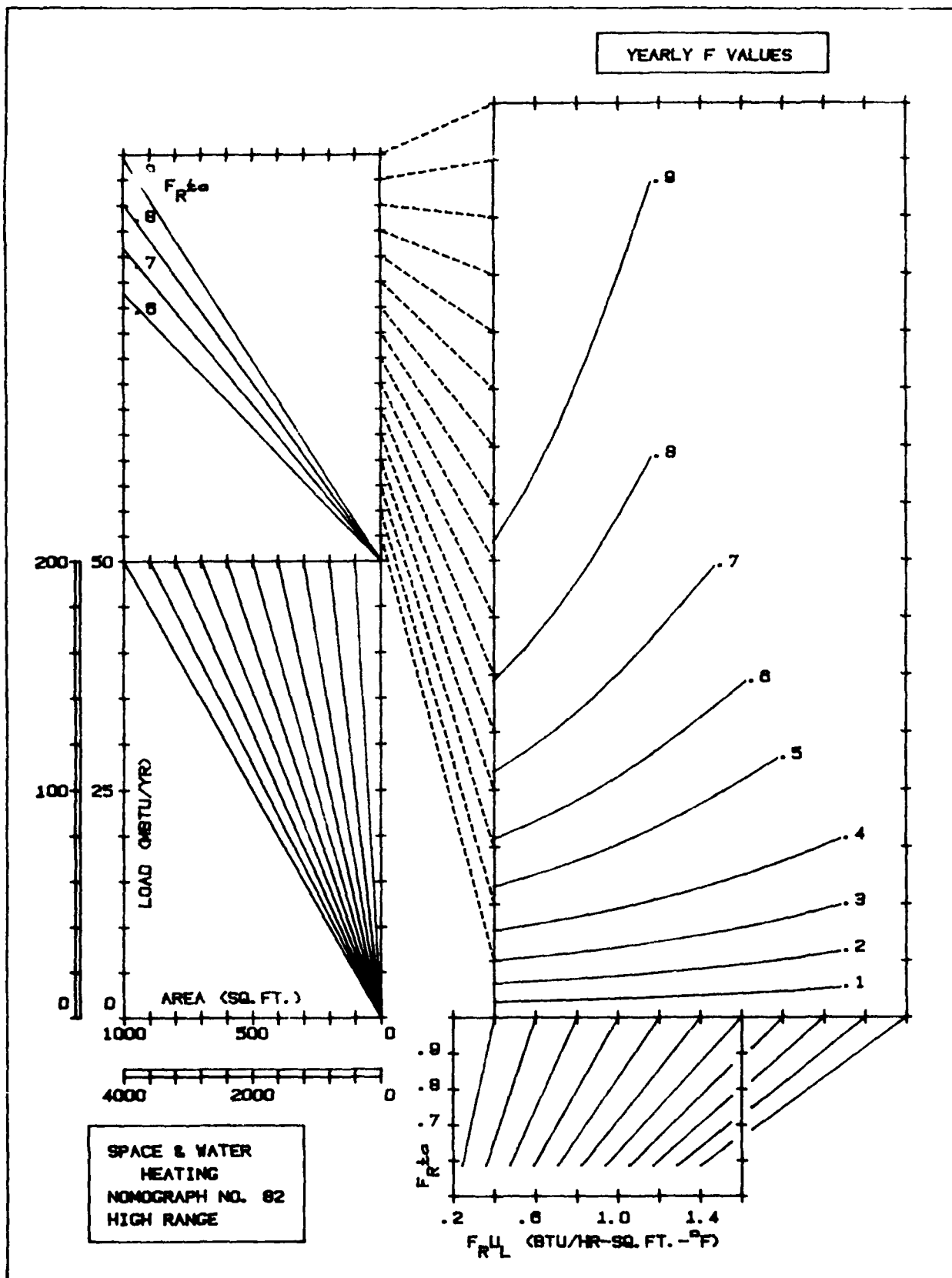
B128



PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS



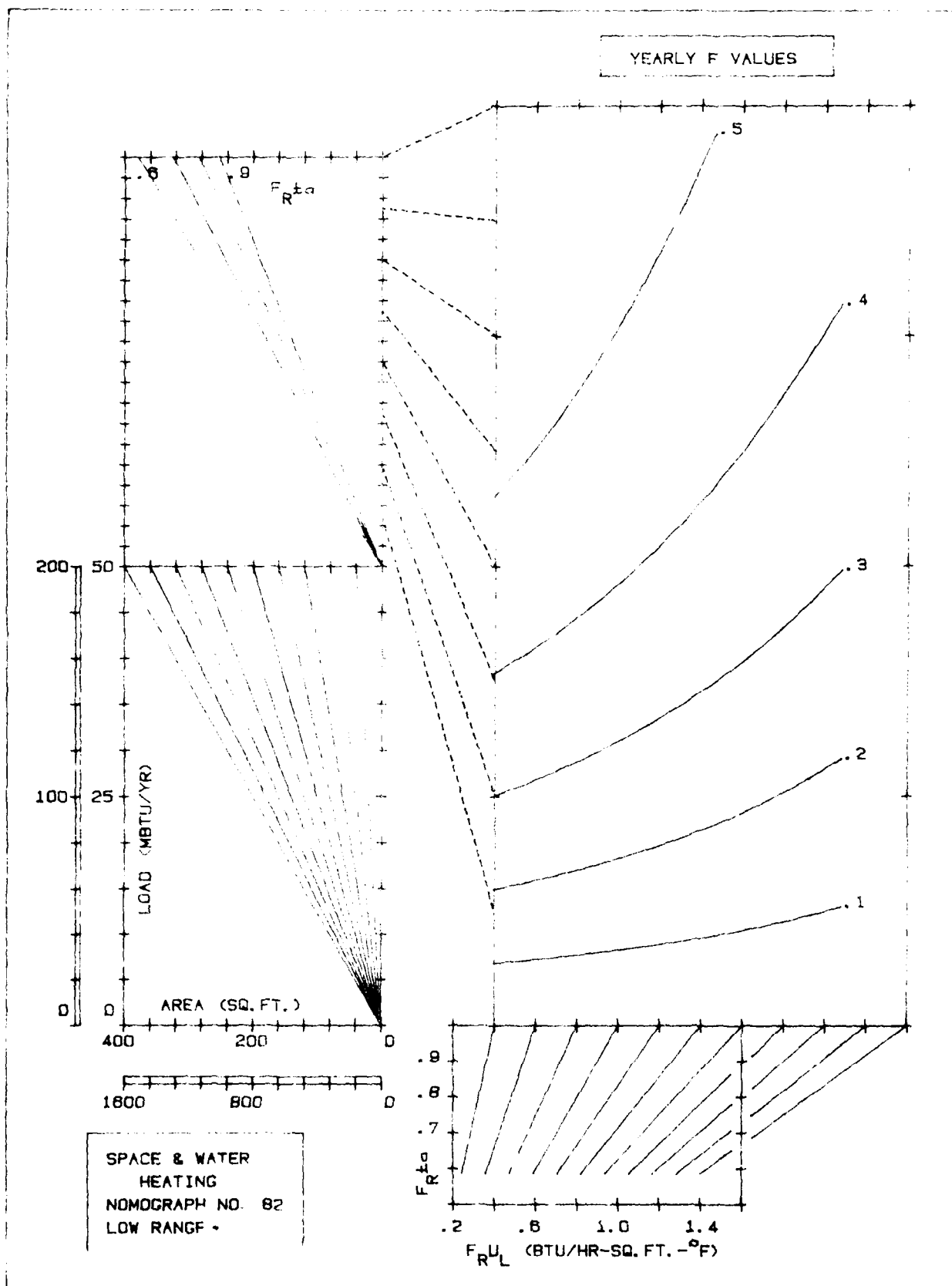
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS



PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS

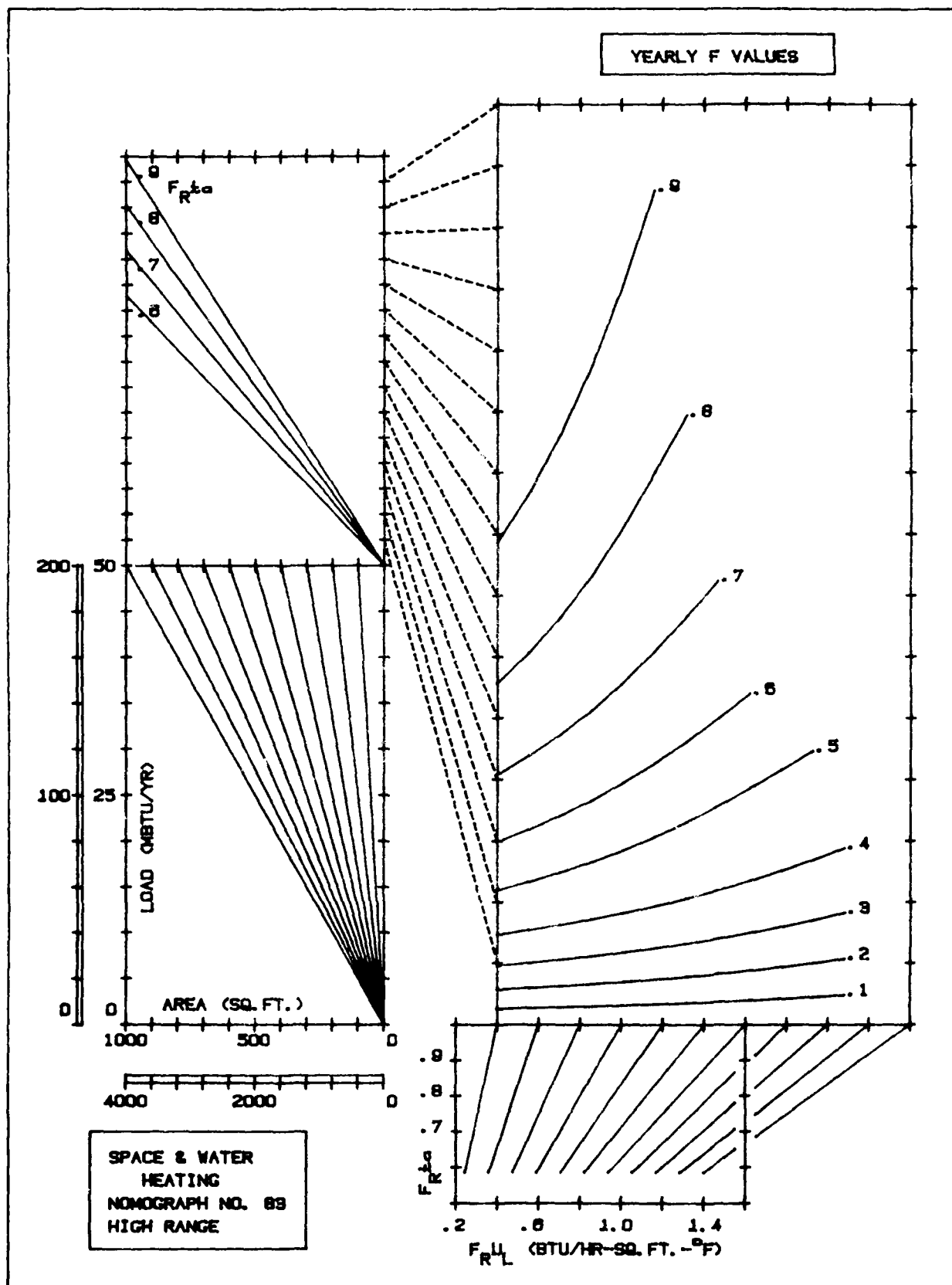
B131

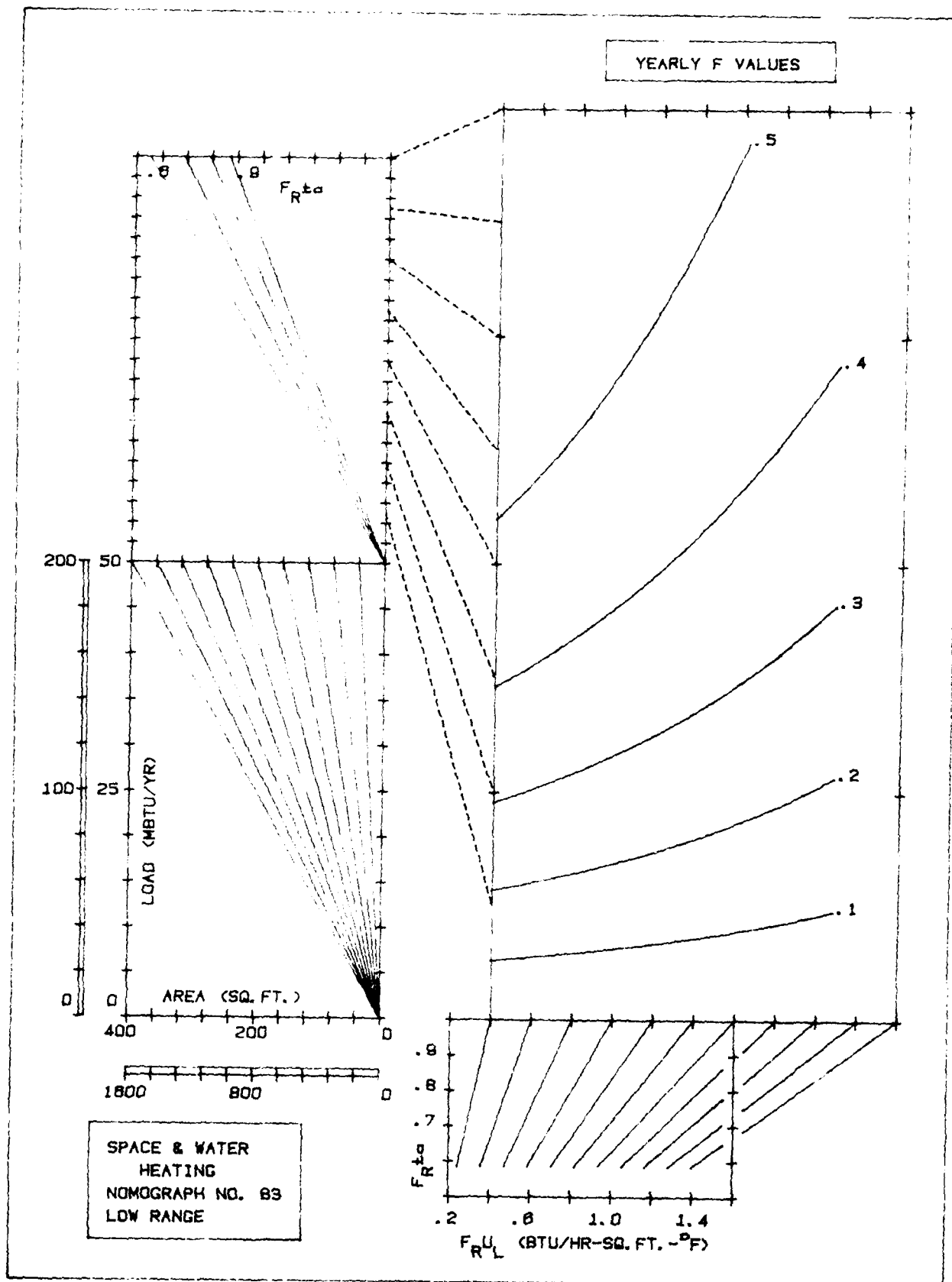




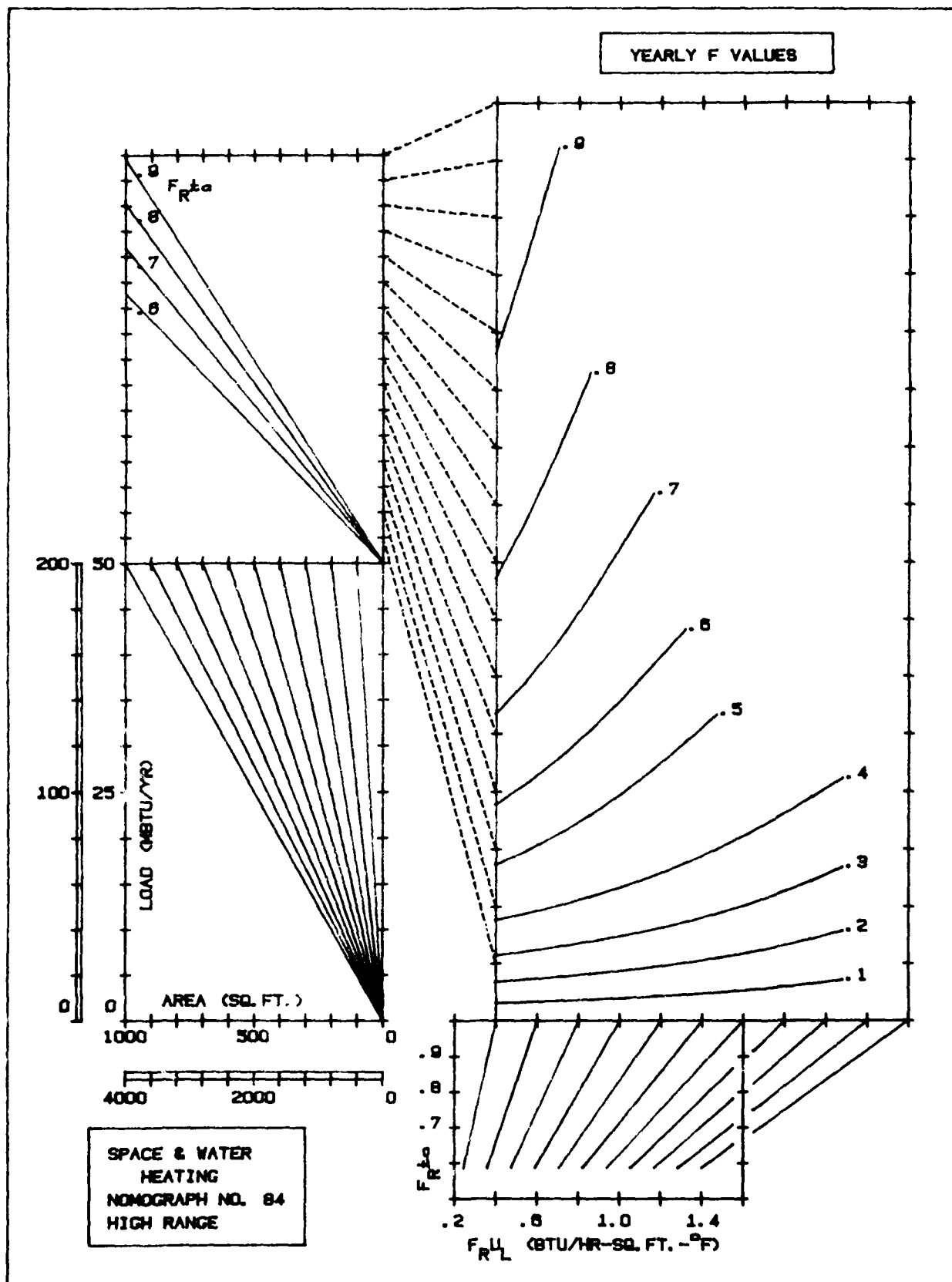
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

B172

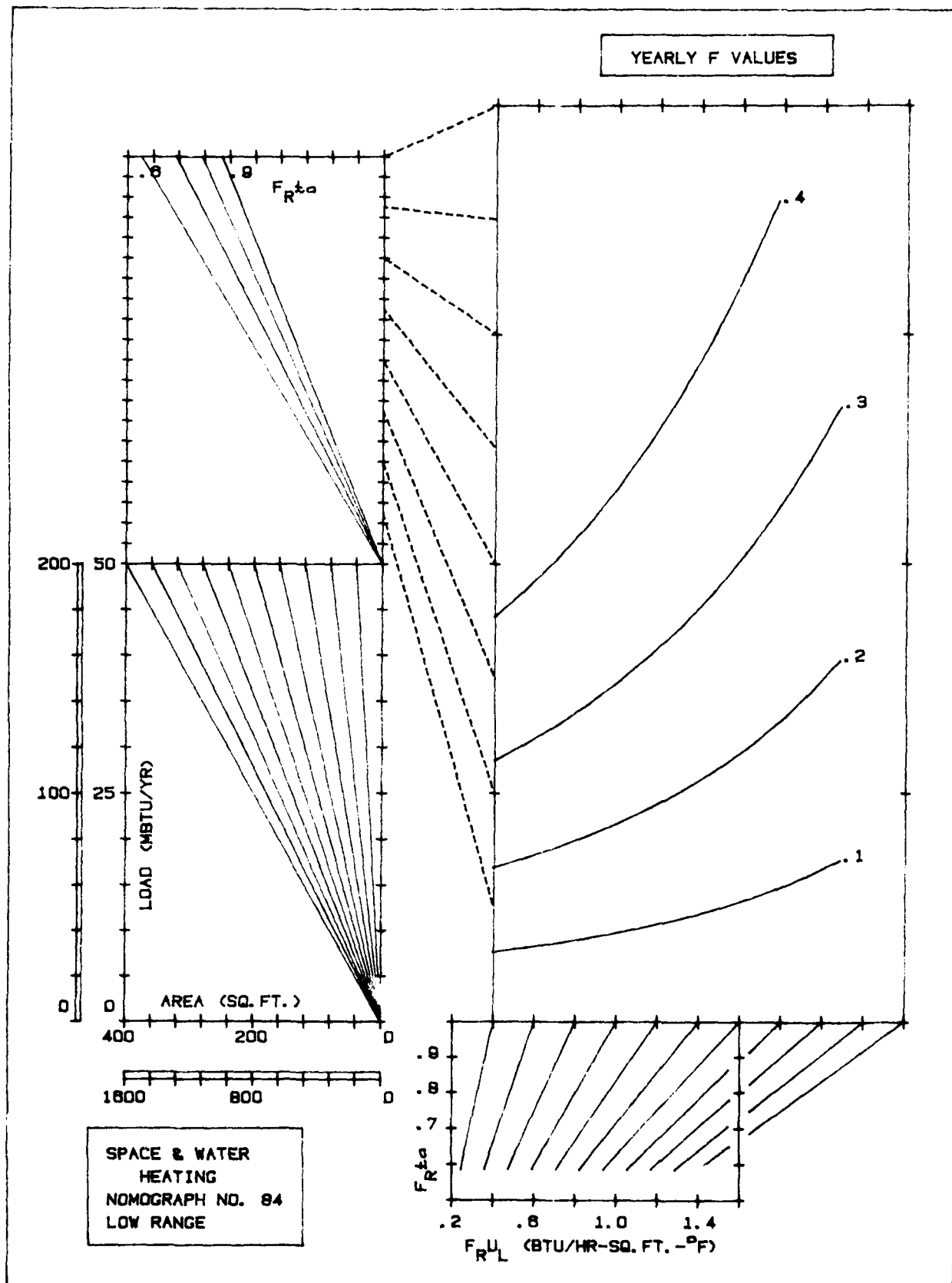




PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

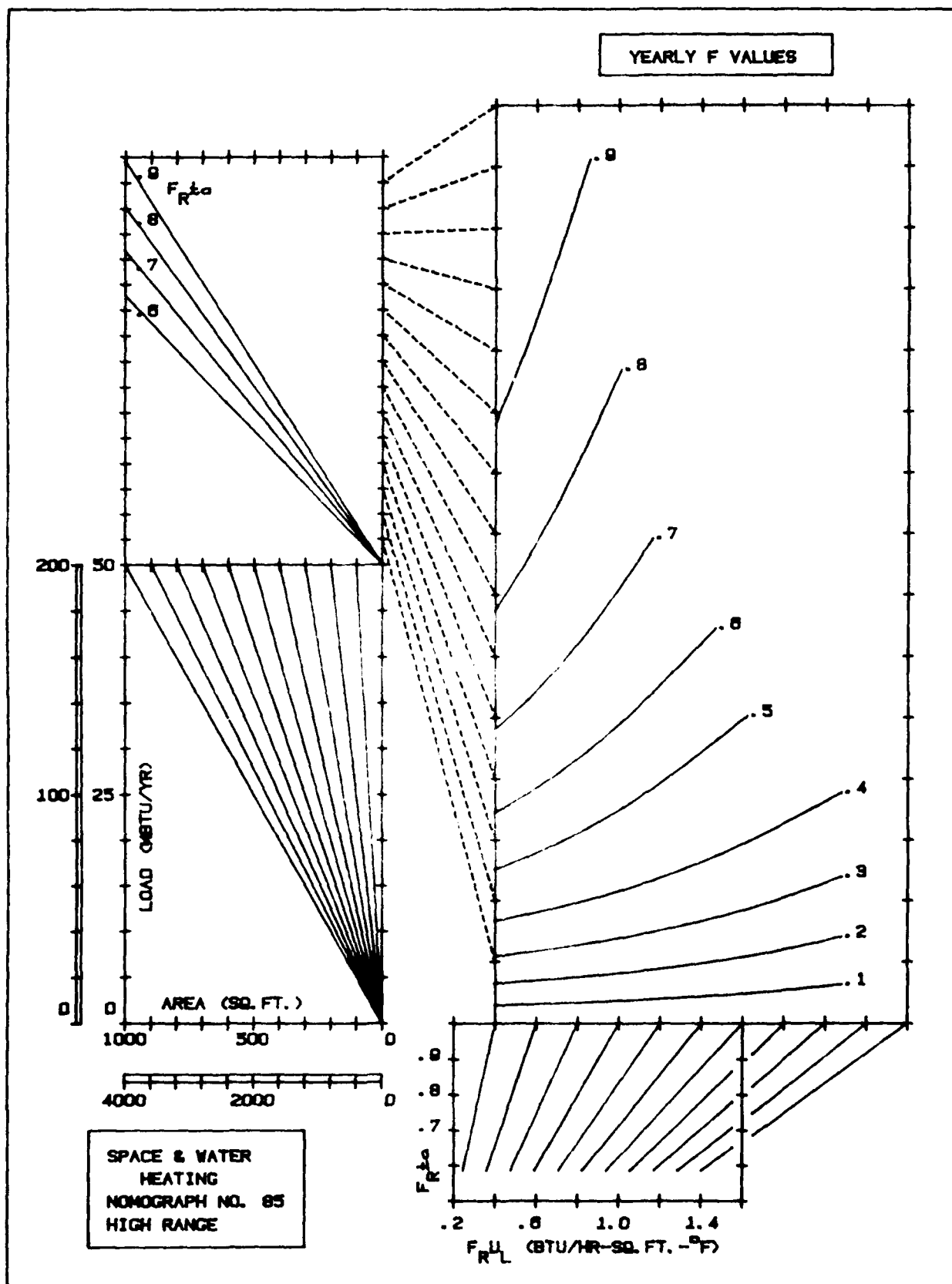


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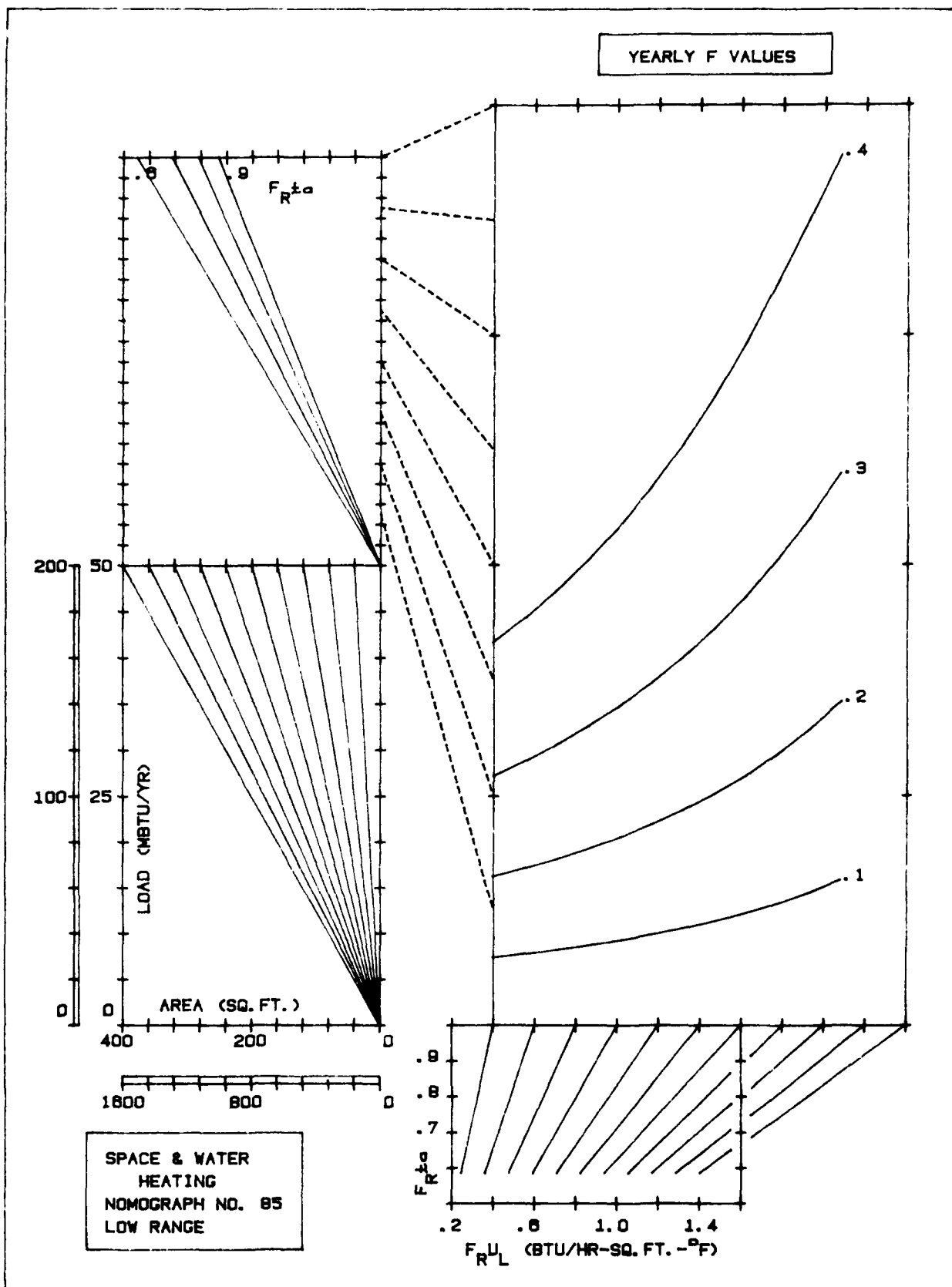


PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

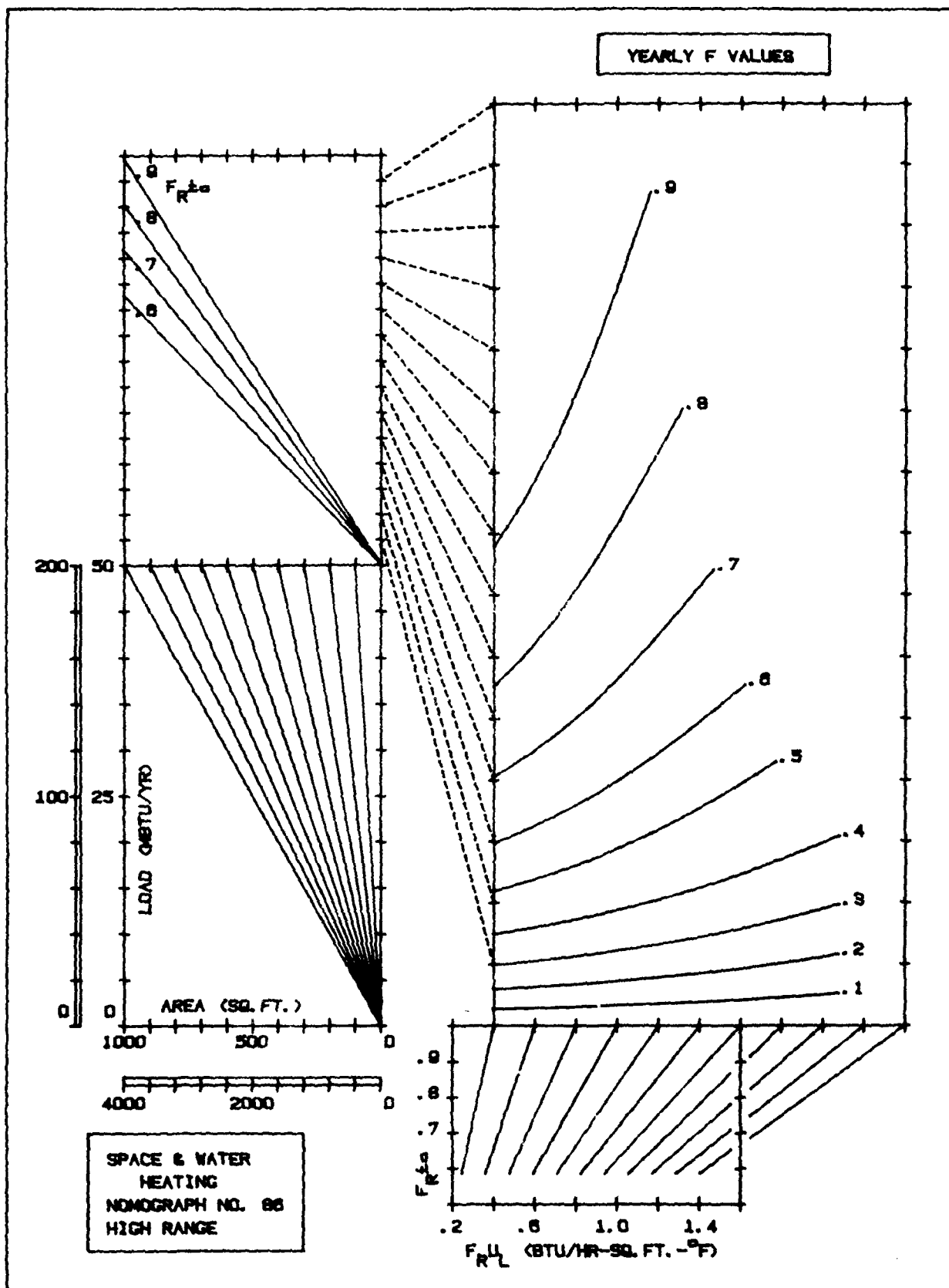
B136



PREPARED 14 JUN 62 FOR AFESC BY USAFA/DFMS

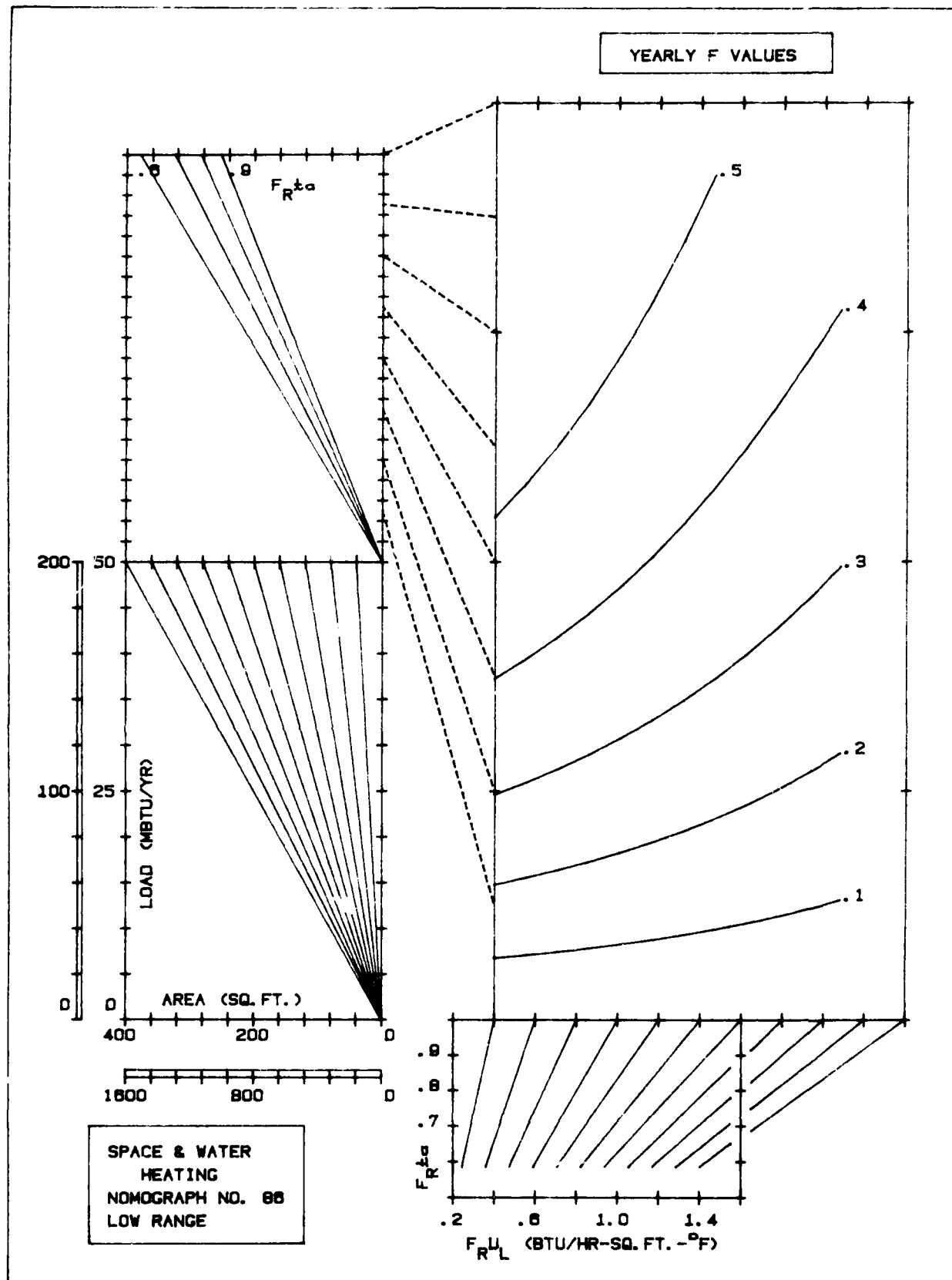


PREPARED 07 JUL 62 FOR AFESC BY USAFA/DFMS



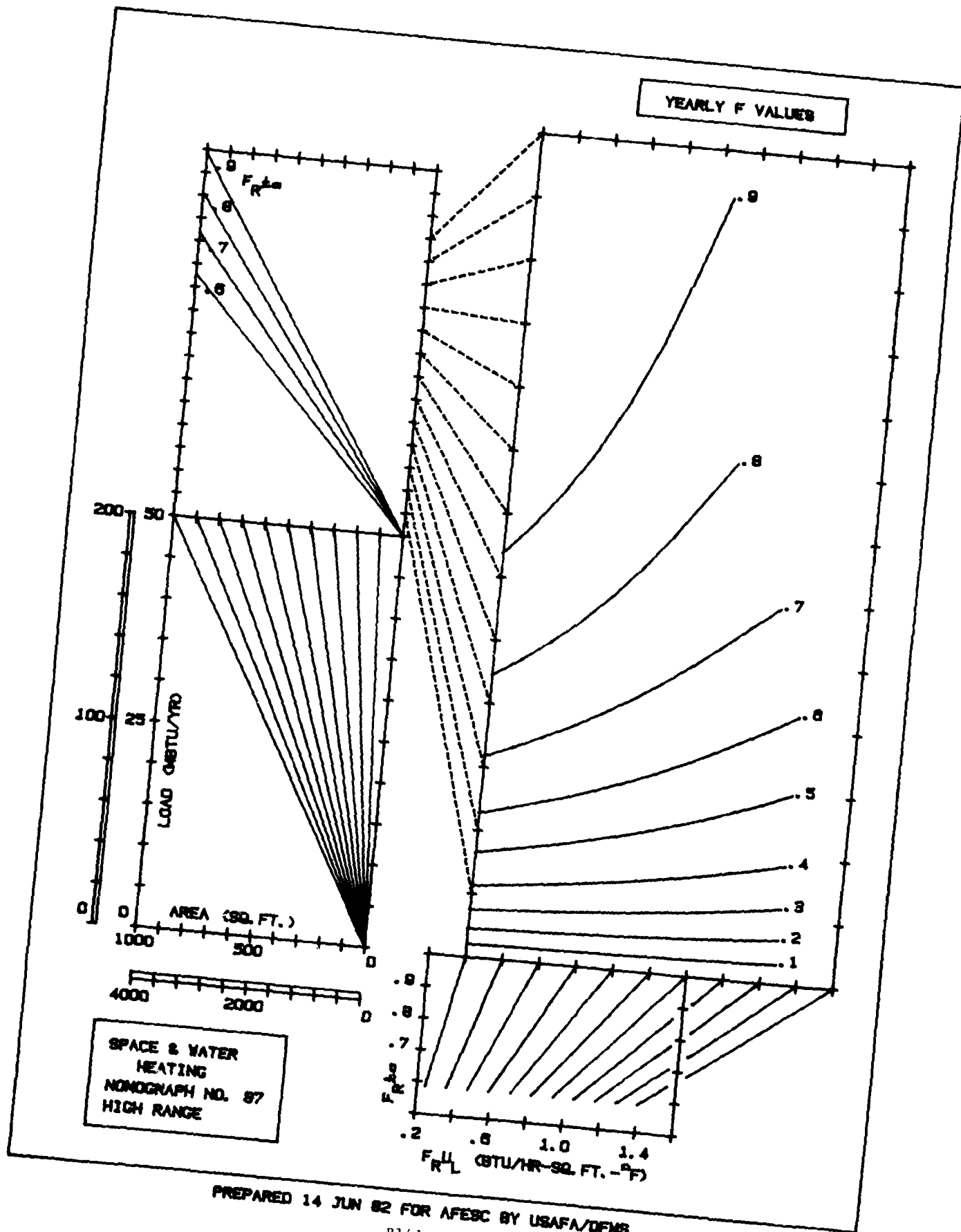
PREPARED 14 JUN 82 FOR AFESC BY USAFA/DFMS



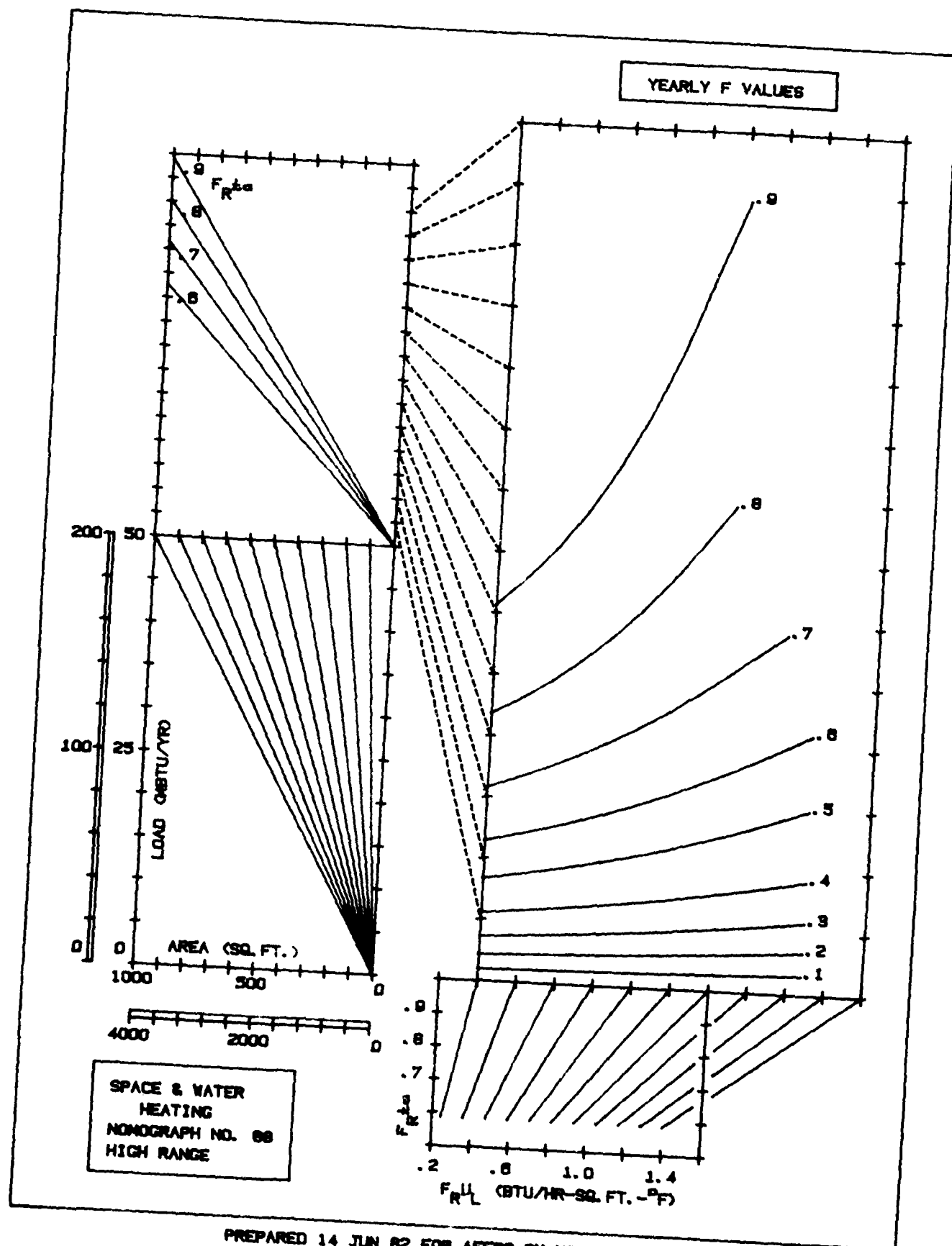


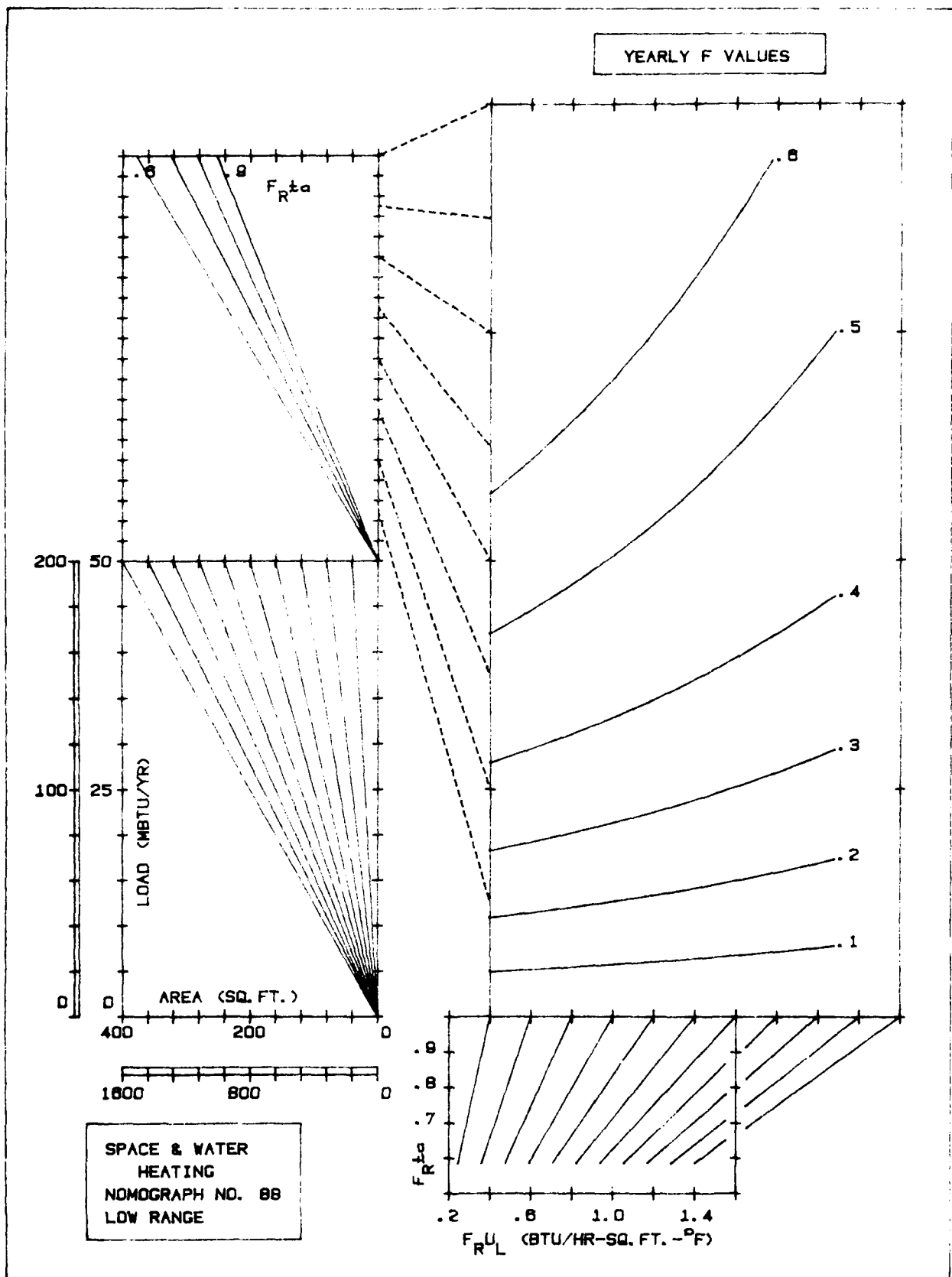
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

R140



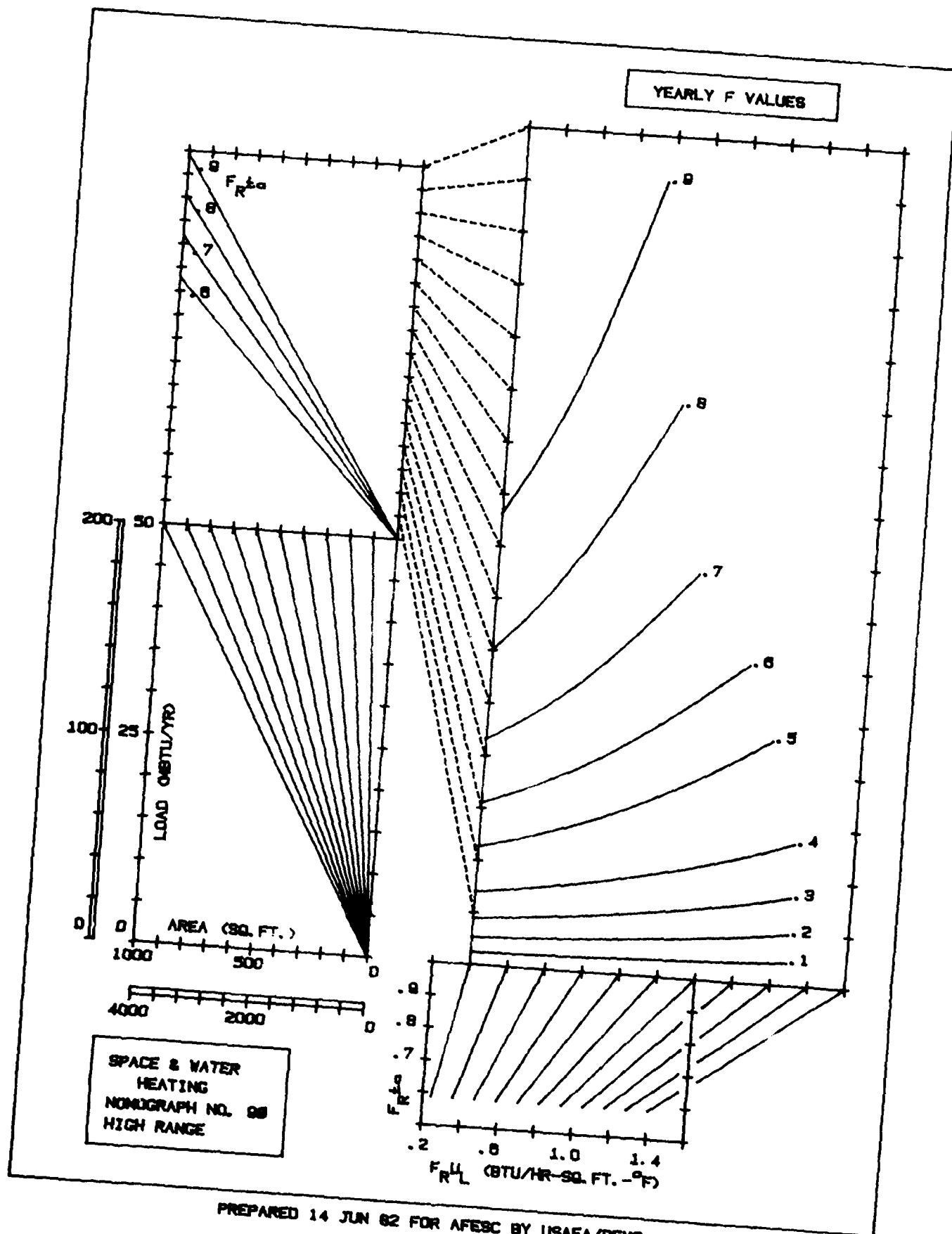


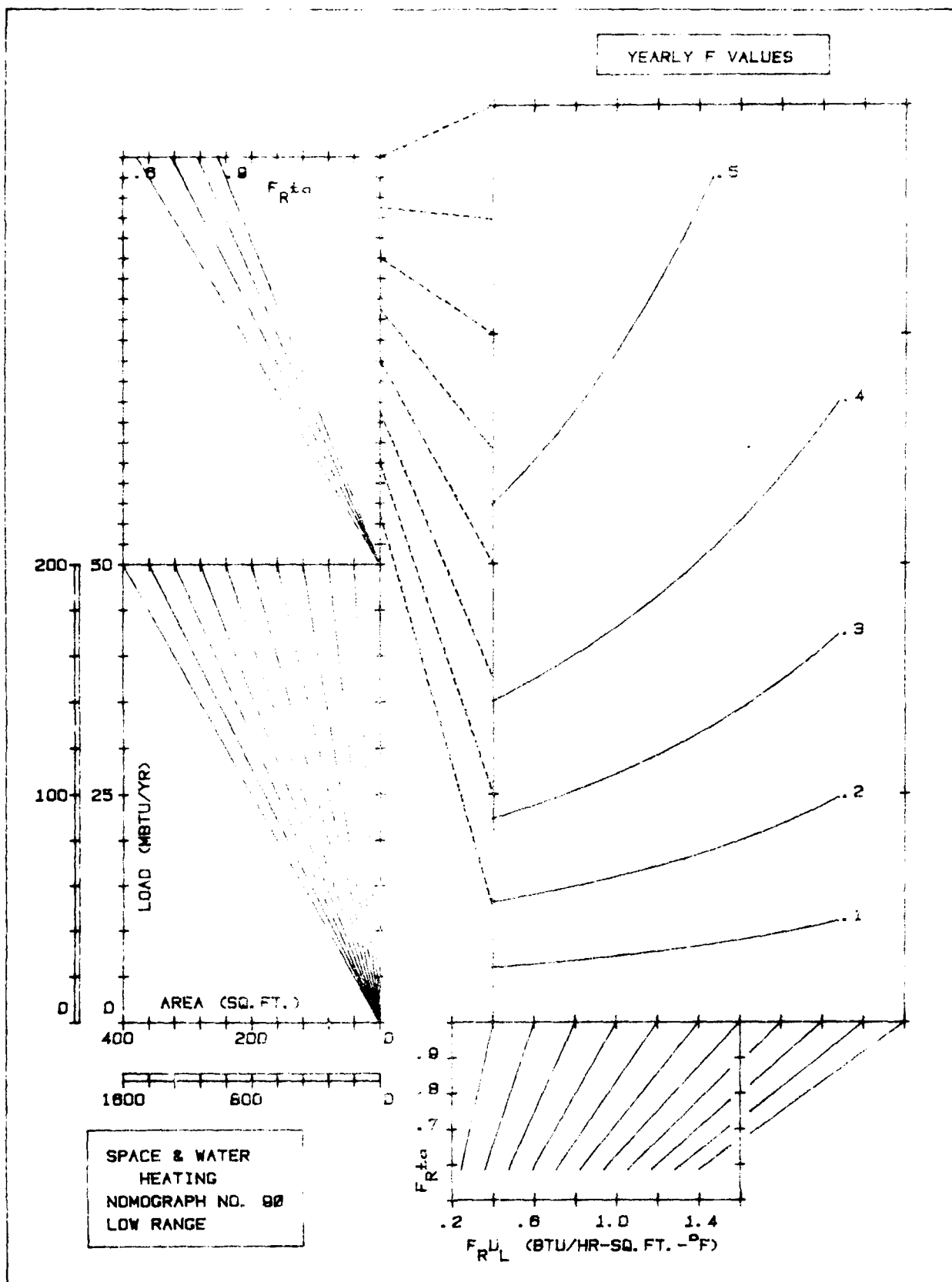




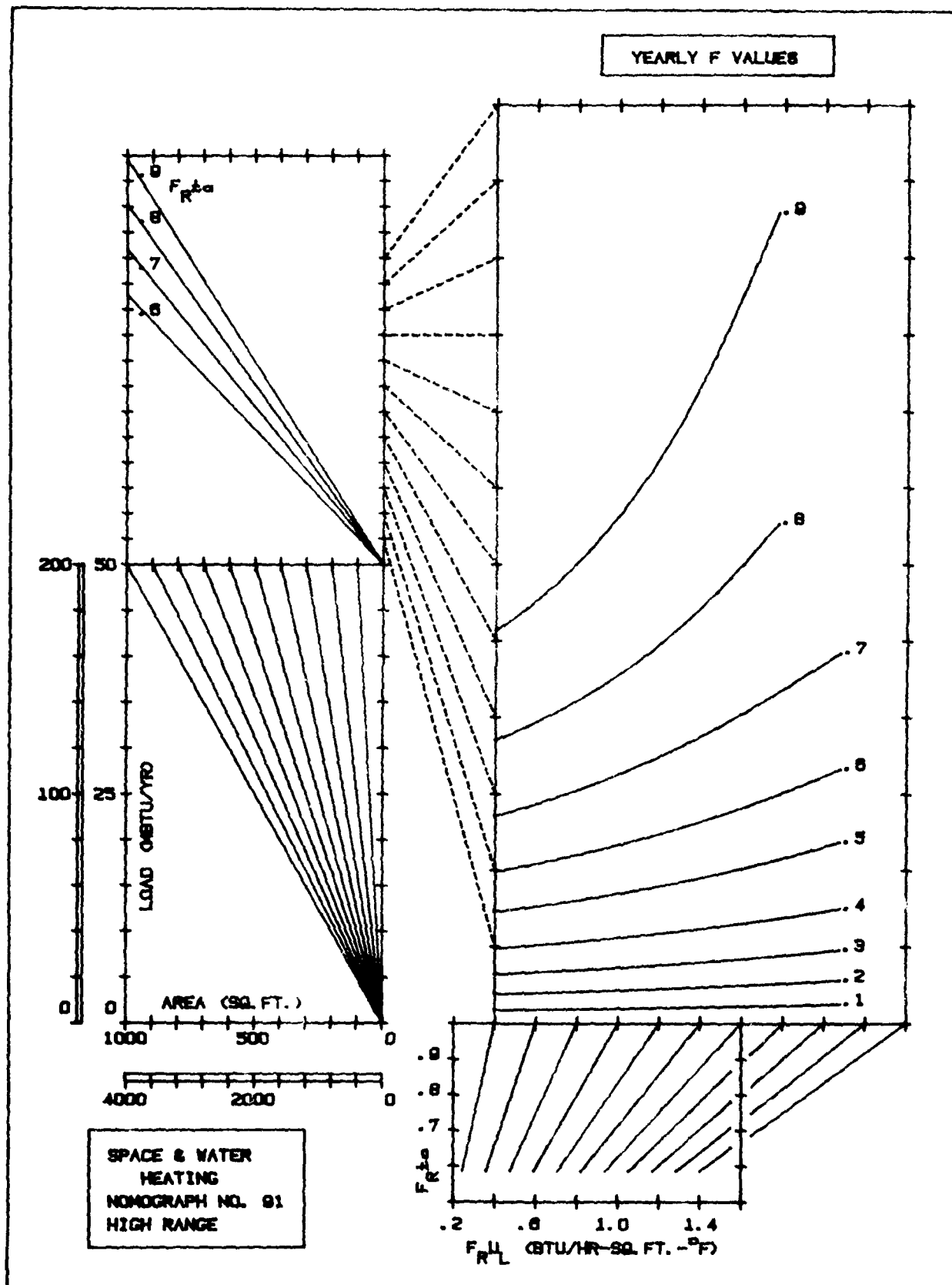
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

B144



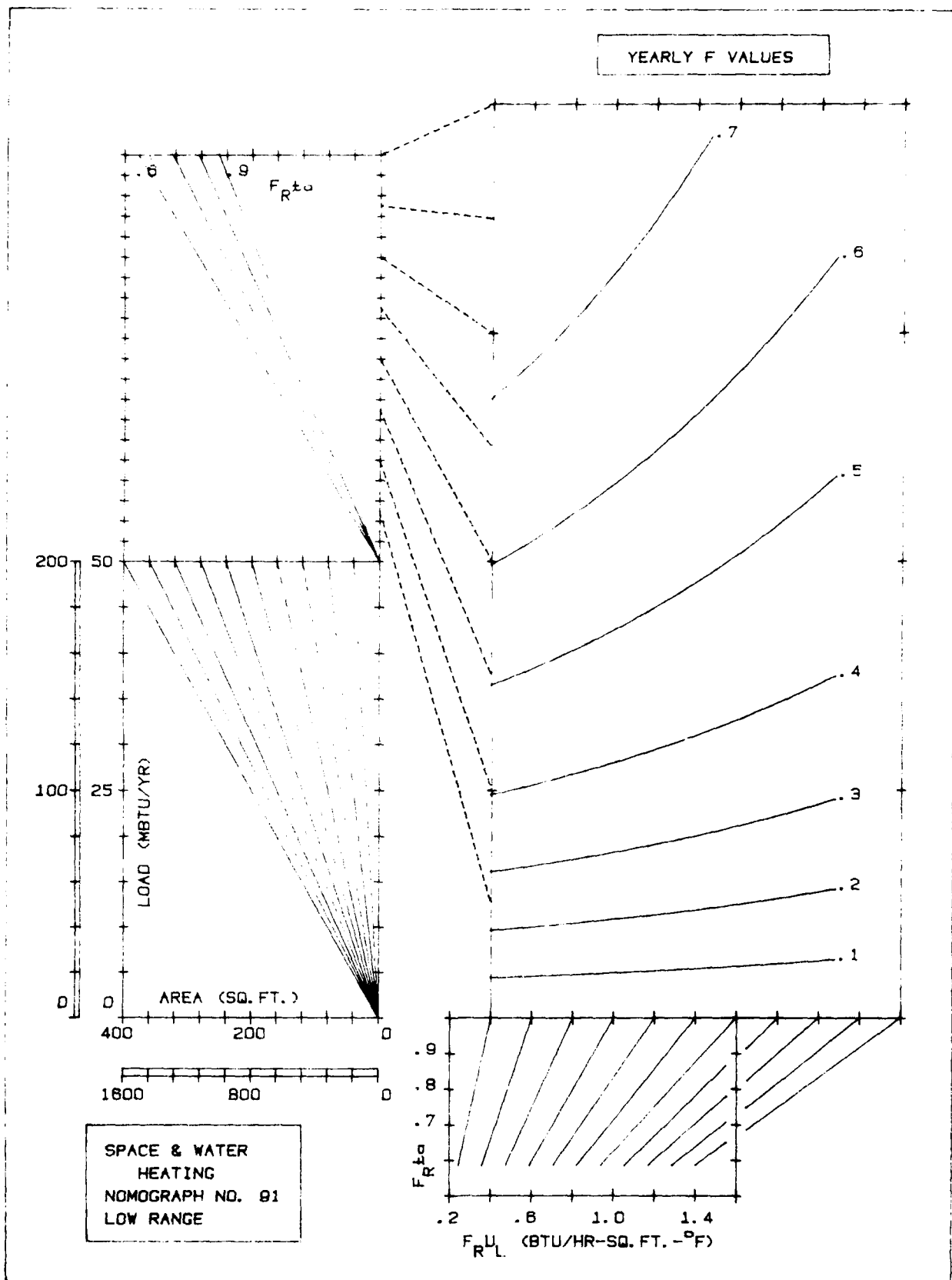


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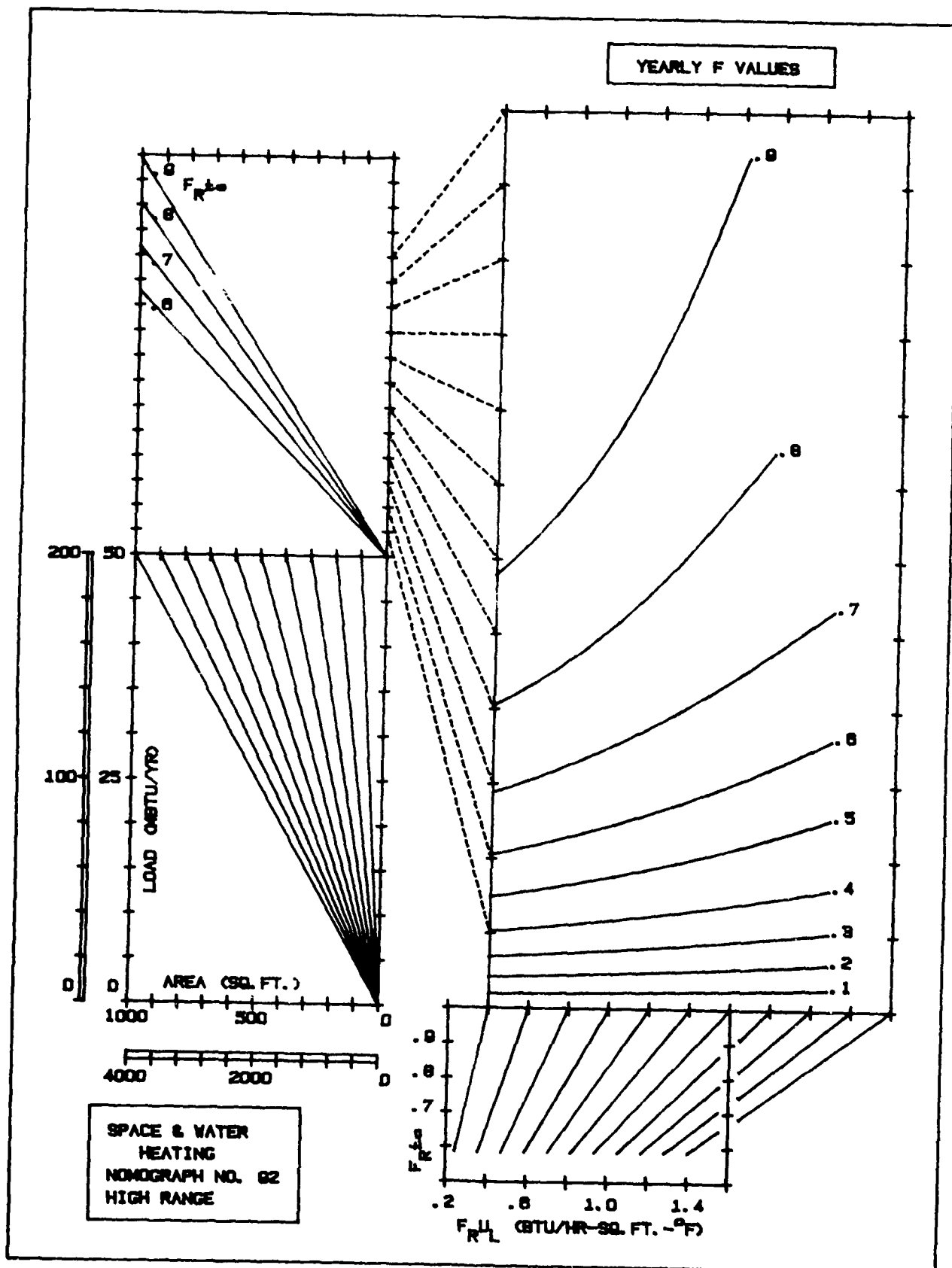
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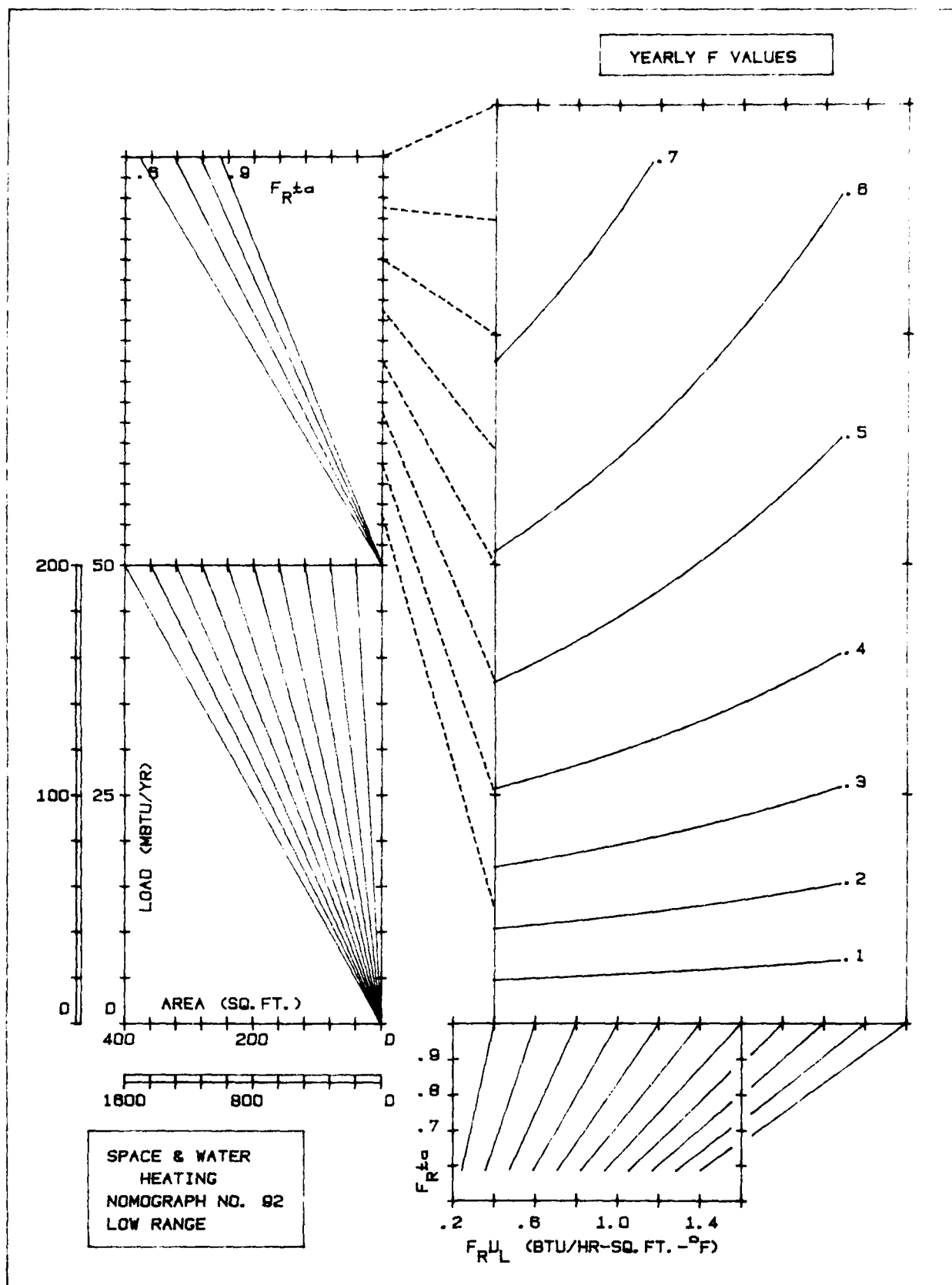


PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

BJ48

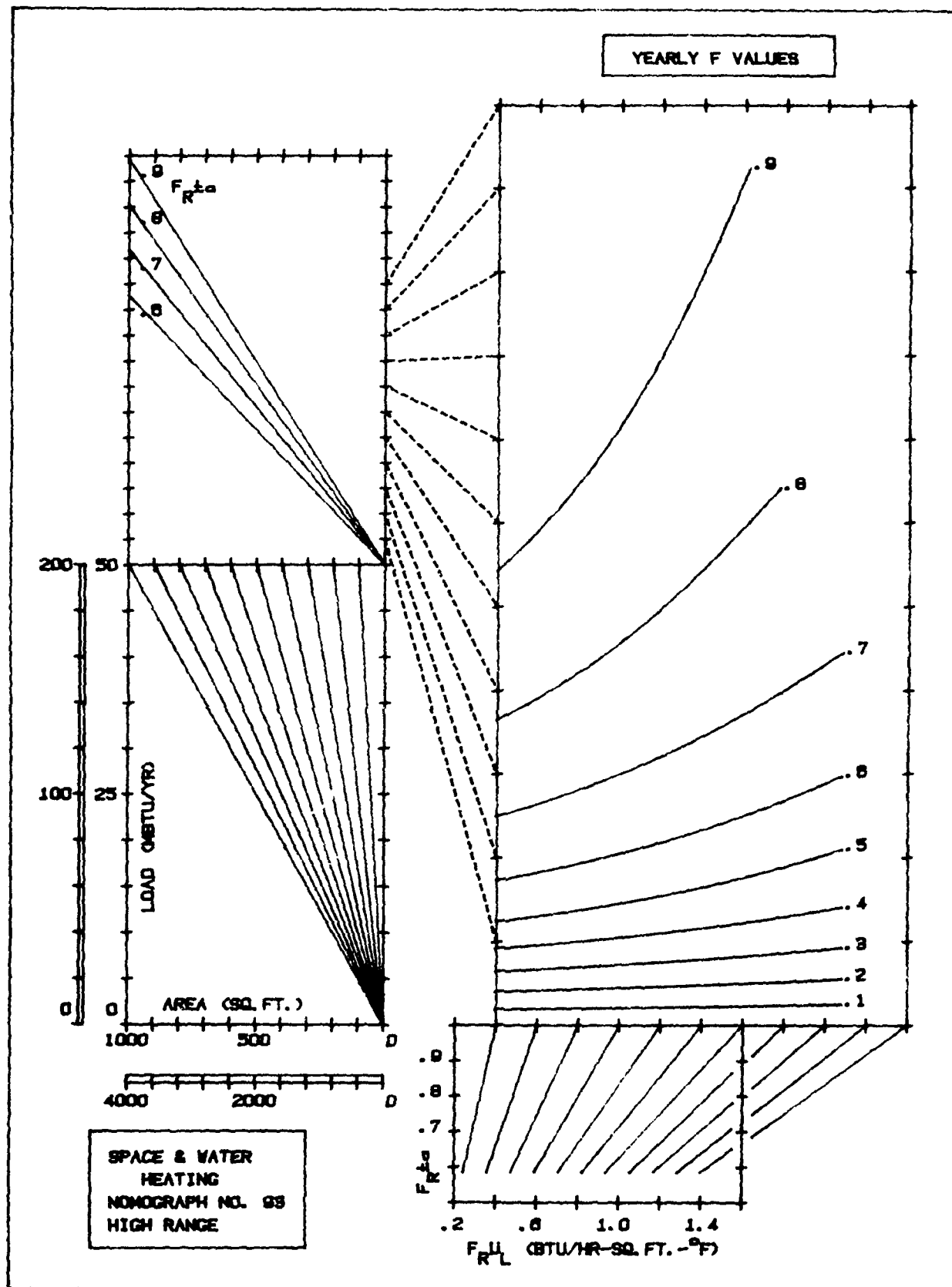


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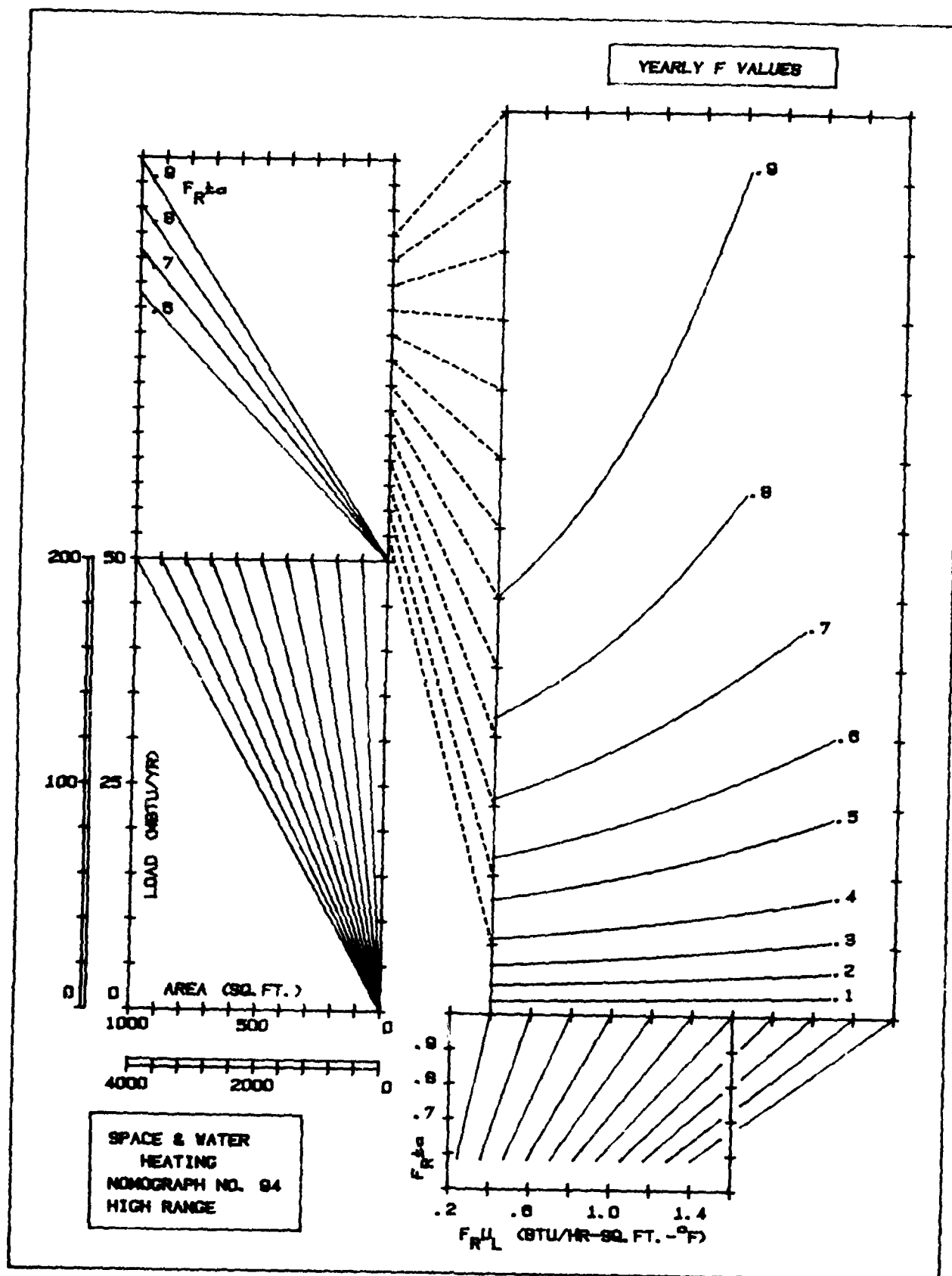
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

B150

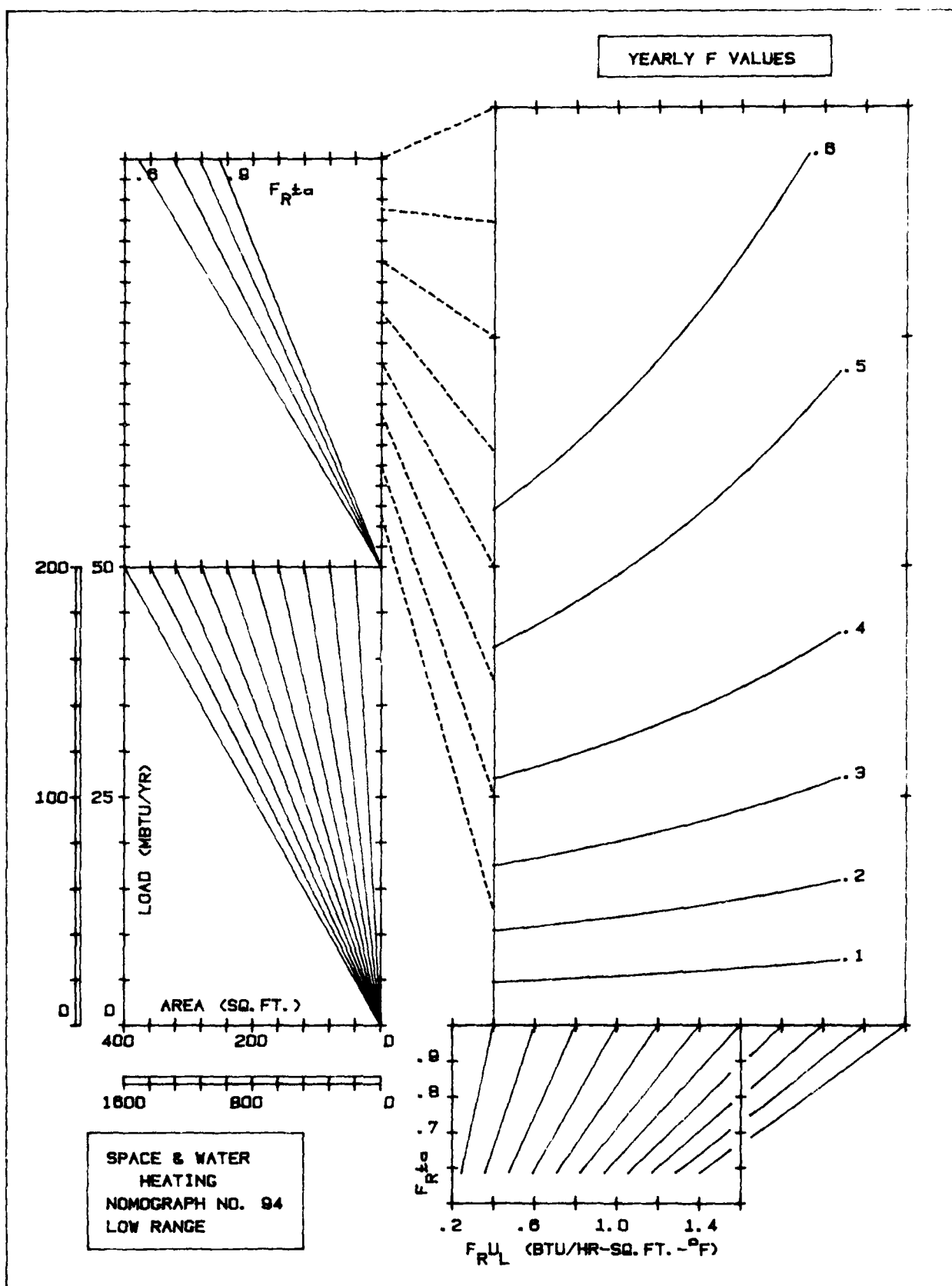


PREPARED 15 JUN 82 FOR AFESC BY USAFA/DFMS



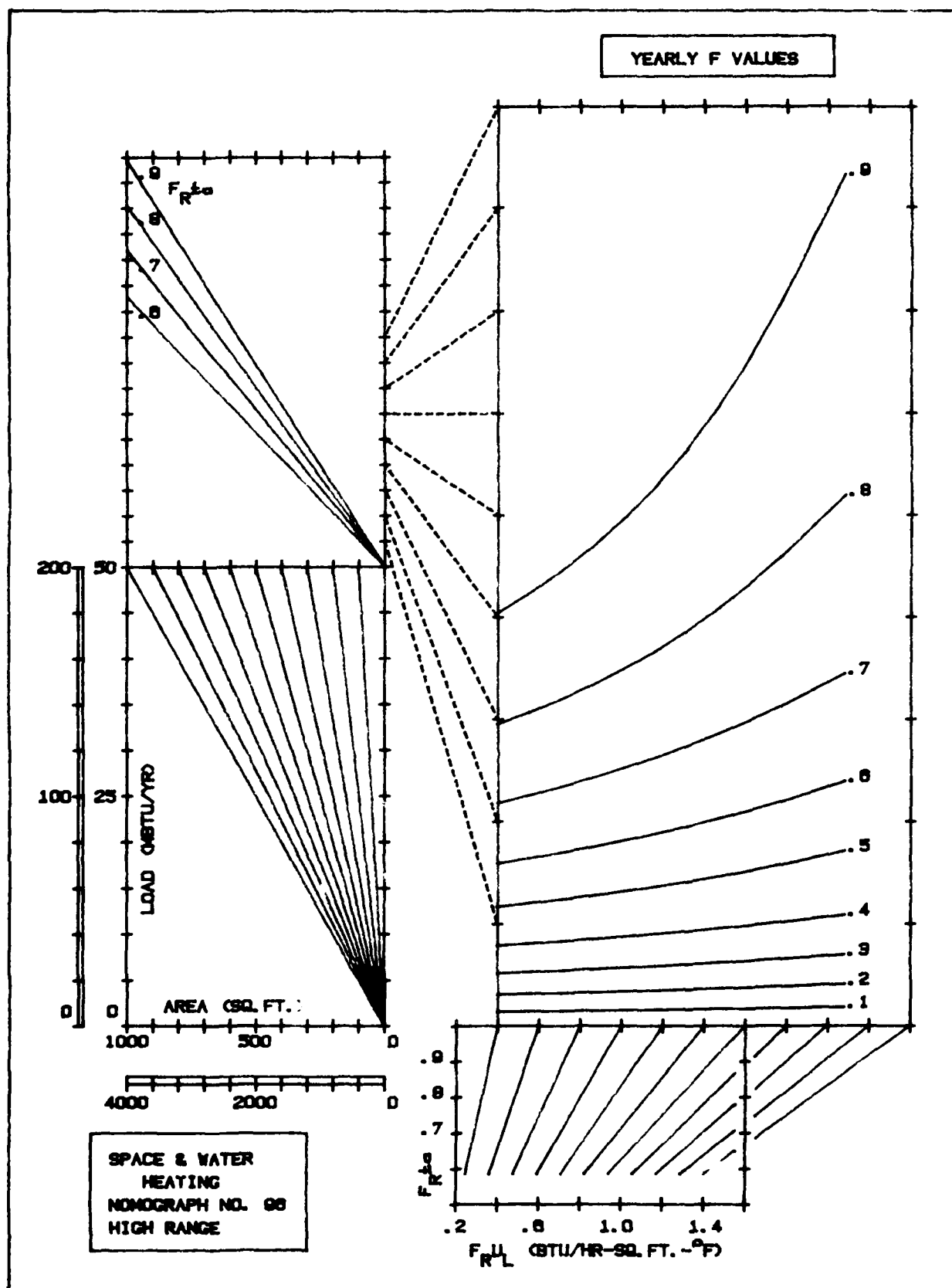


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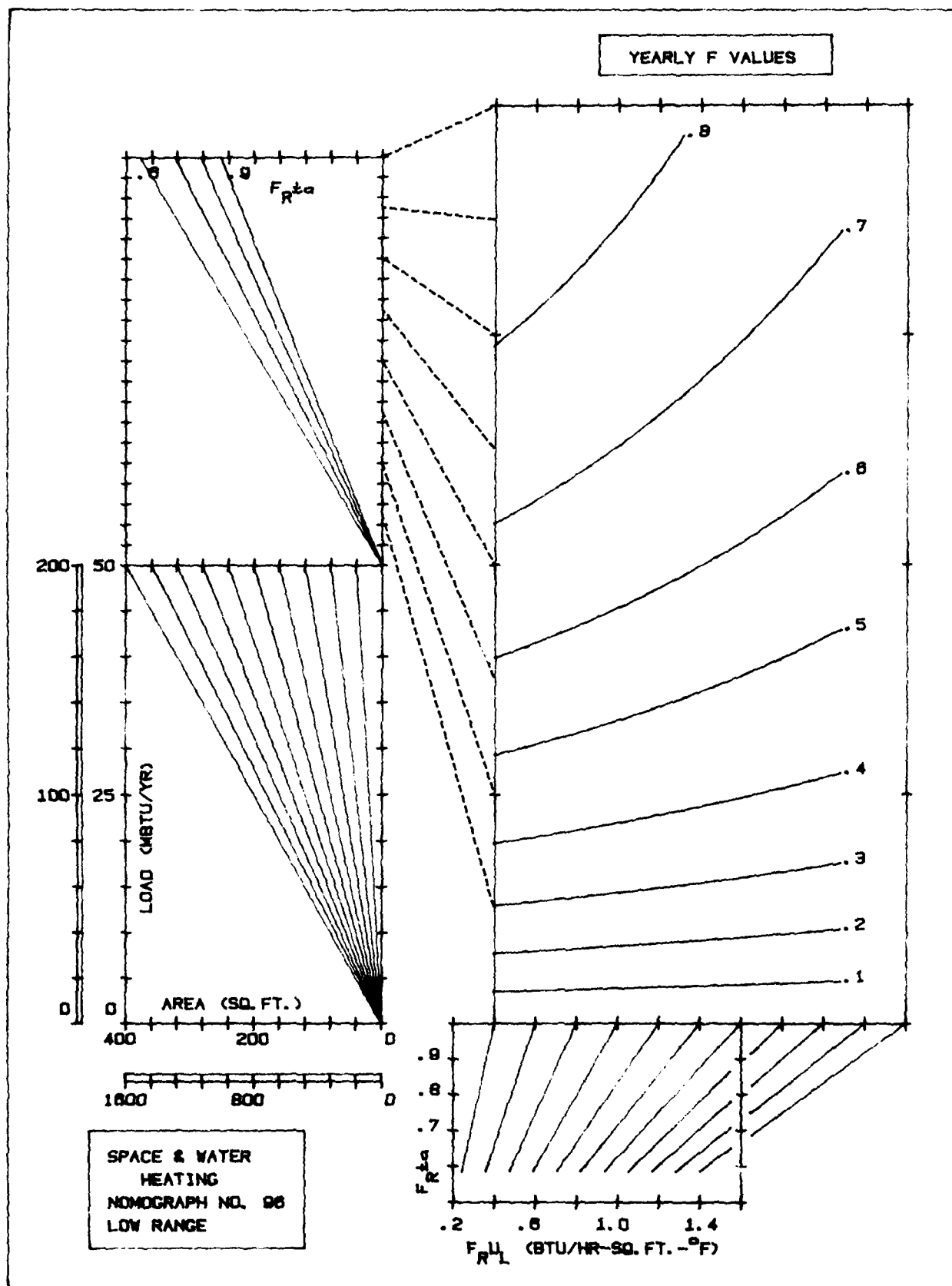
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

B154

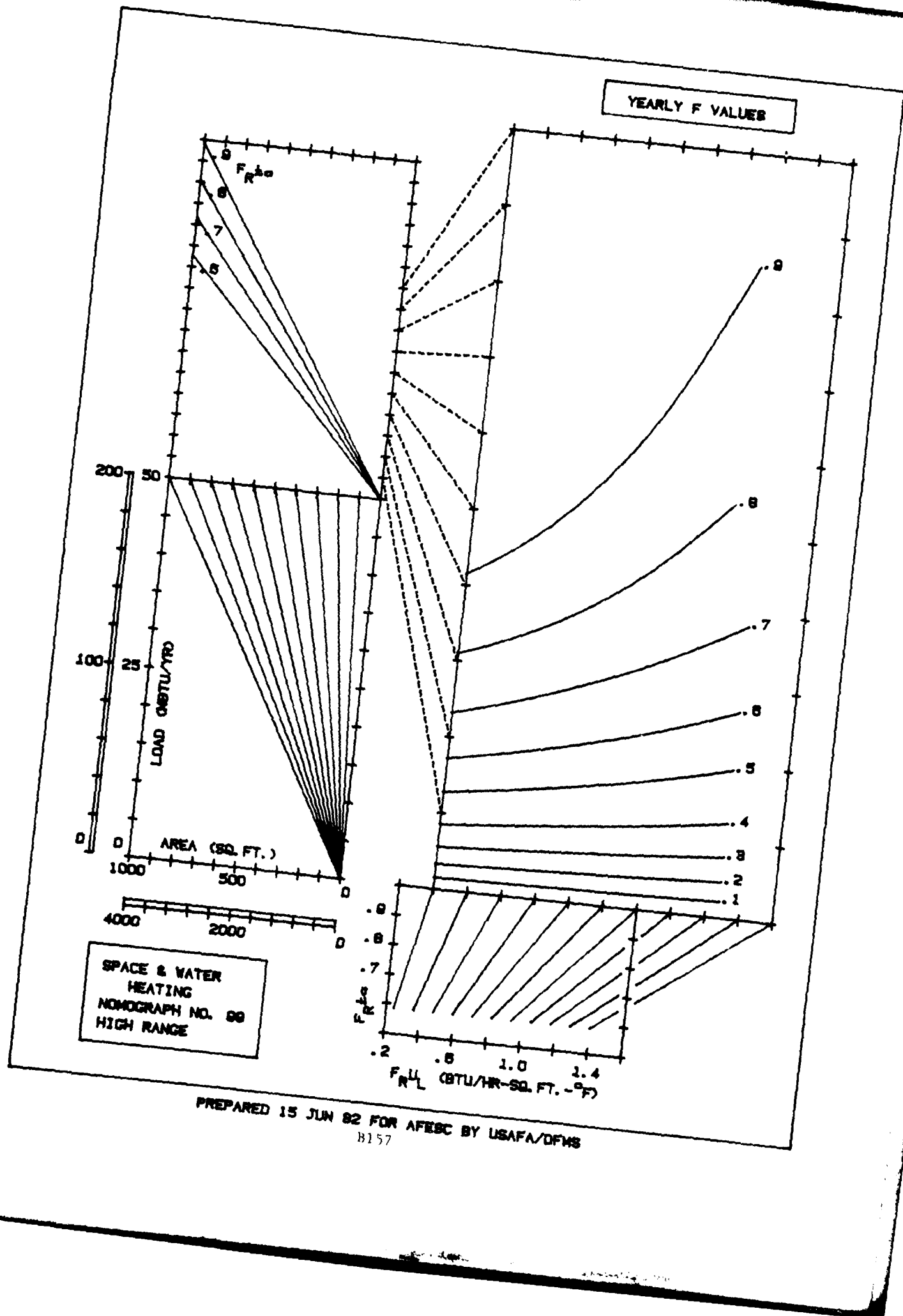


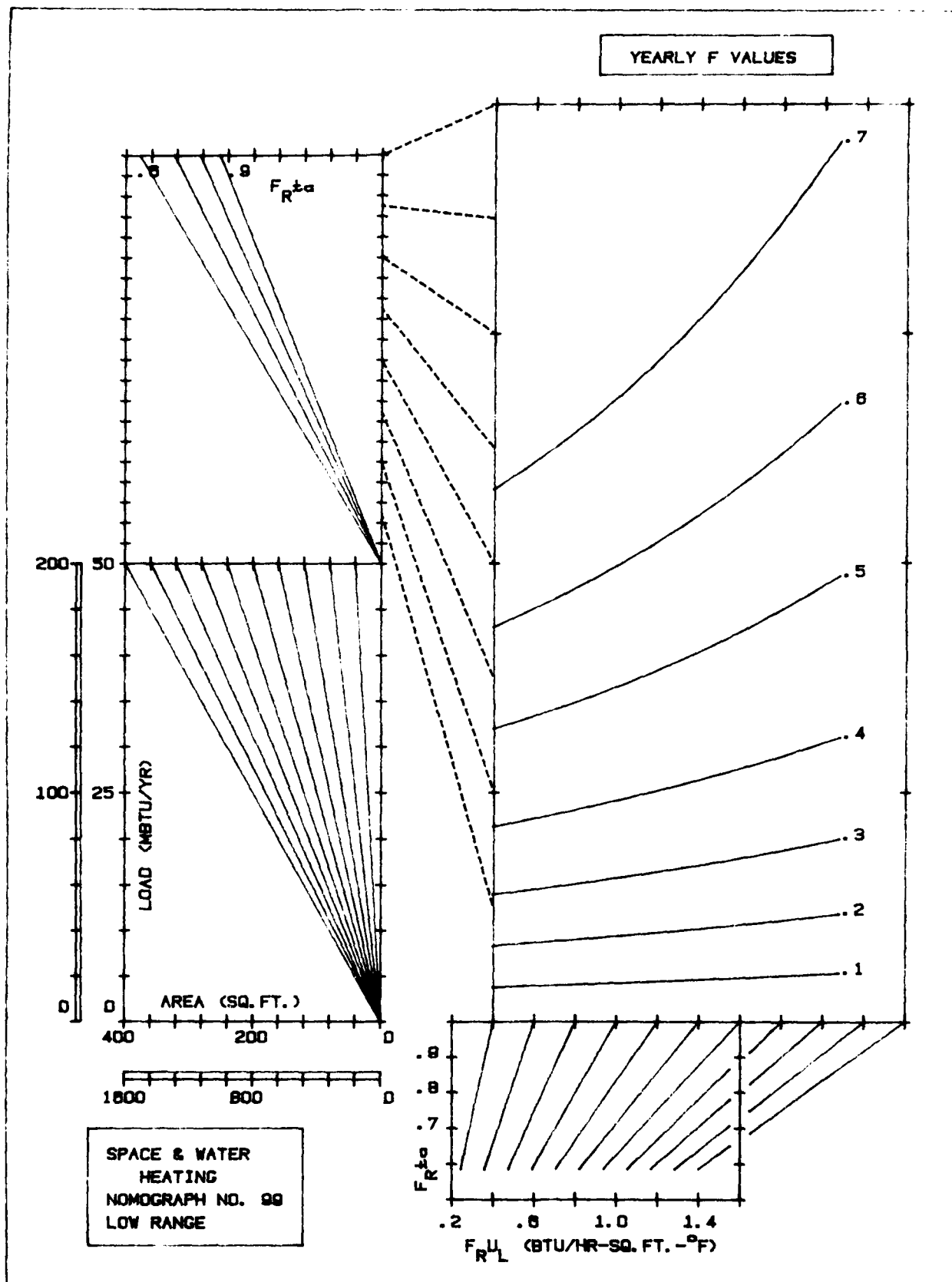
PREPARED 15 JUN 82 FOR AFESC BY USAFA/DFMS





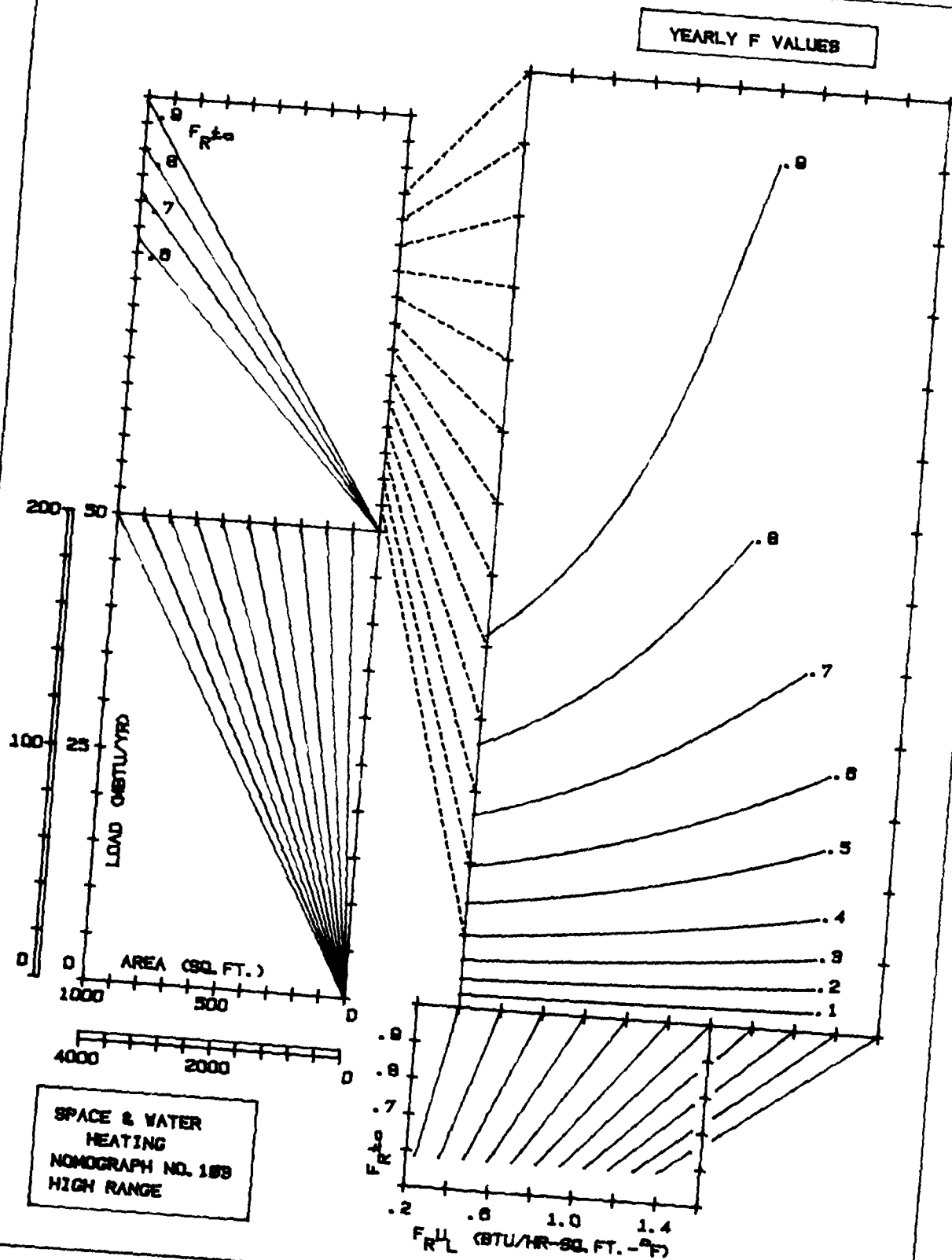
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS





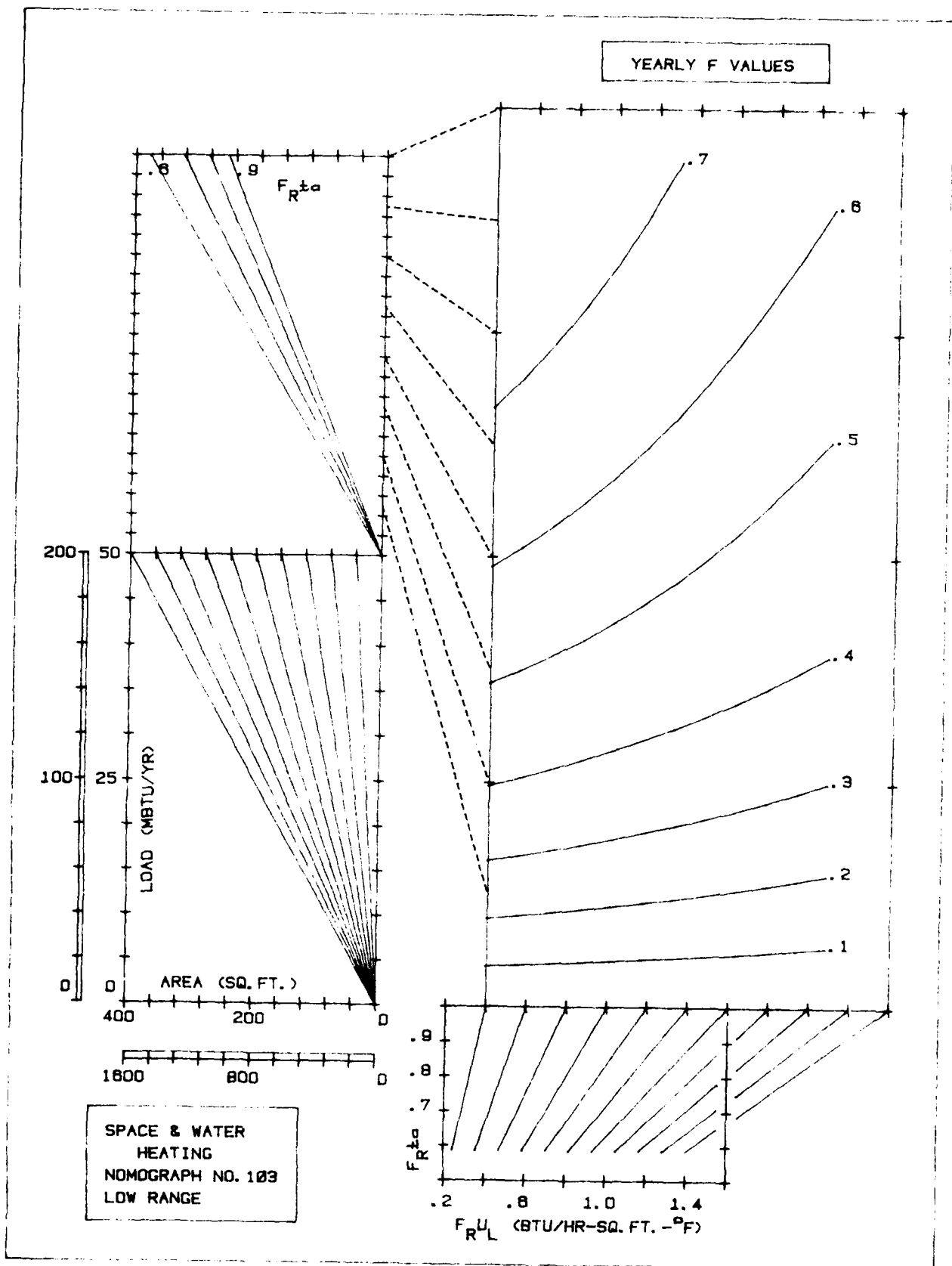
PREPARED 07 JUL 82 FOR AFESC BY USAFA/DFMS

B158



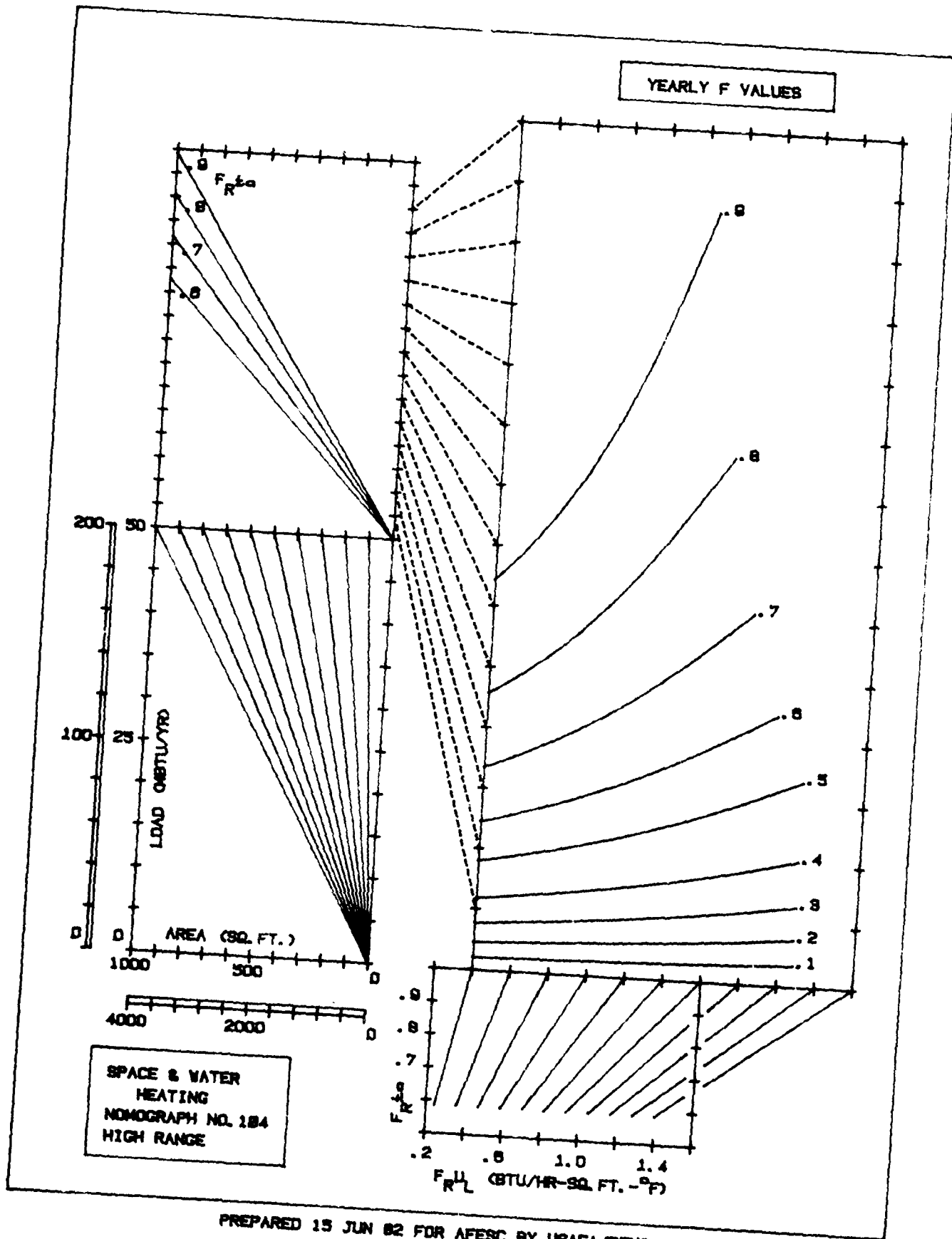
PREPARED 15 JUN 62 FOR AFESC BY USAFA/DFMS

B159



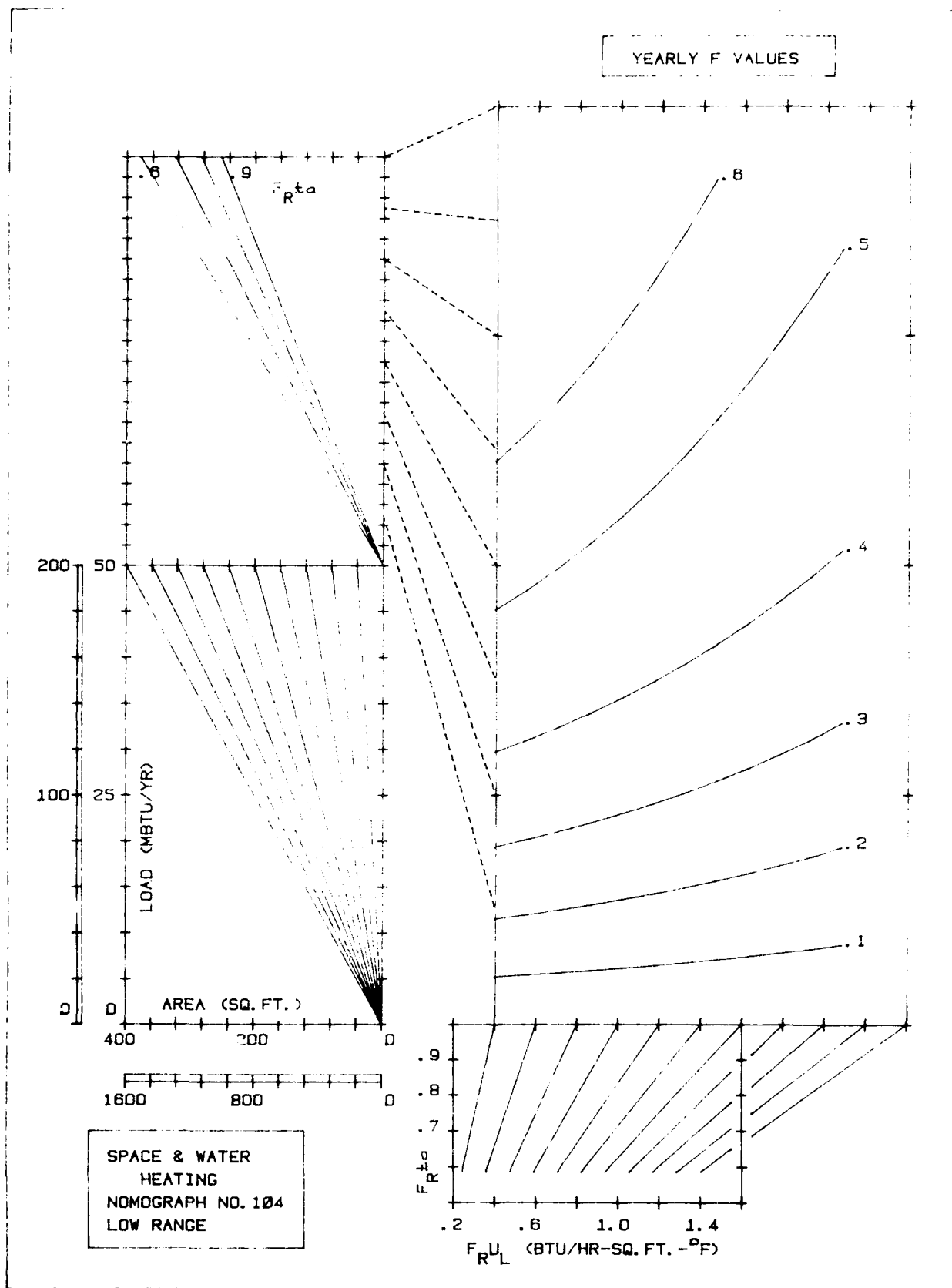
PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

B160



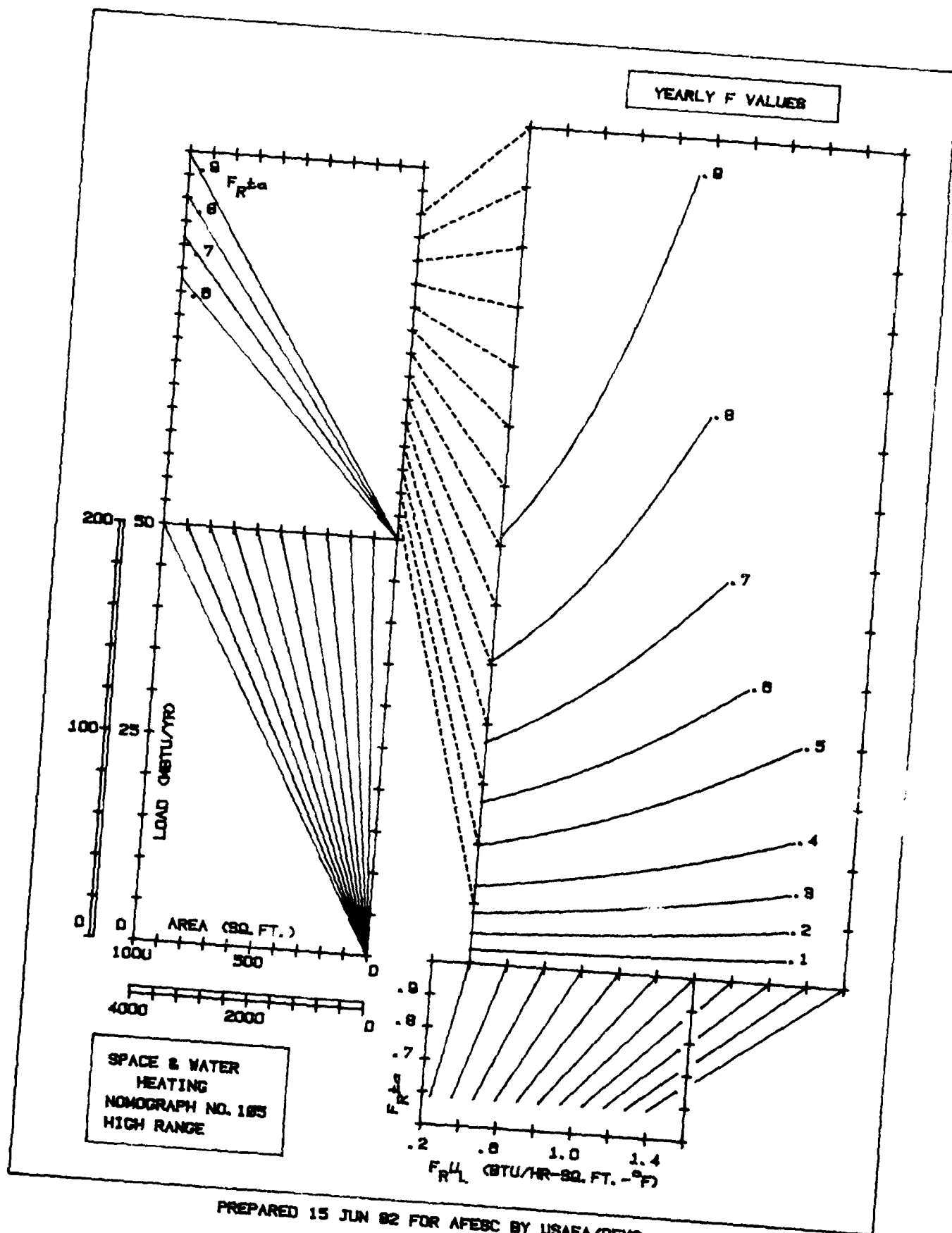
PREPARED 15 JUN 82 FOR AFESC BY USAFA/DFMS

B161

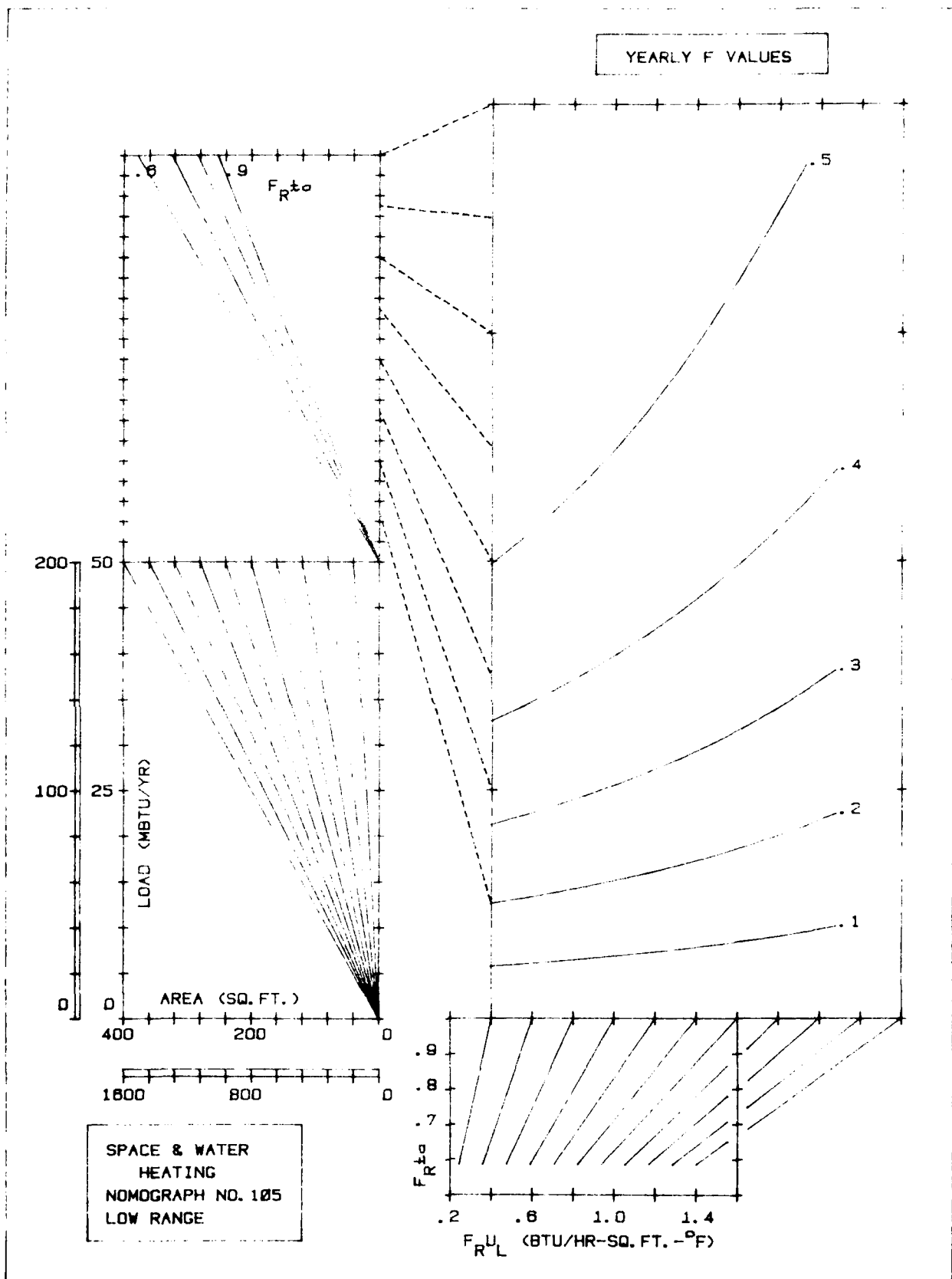


PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

B162

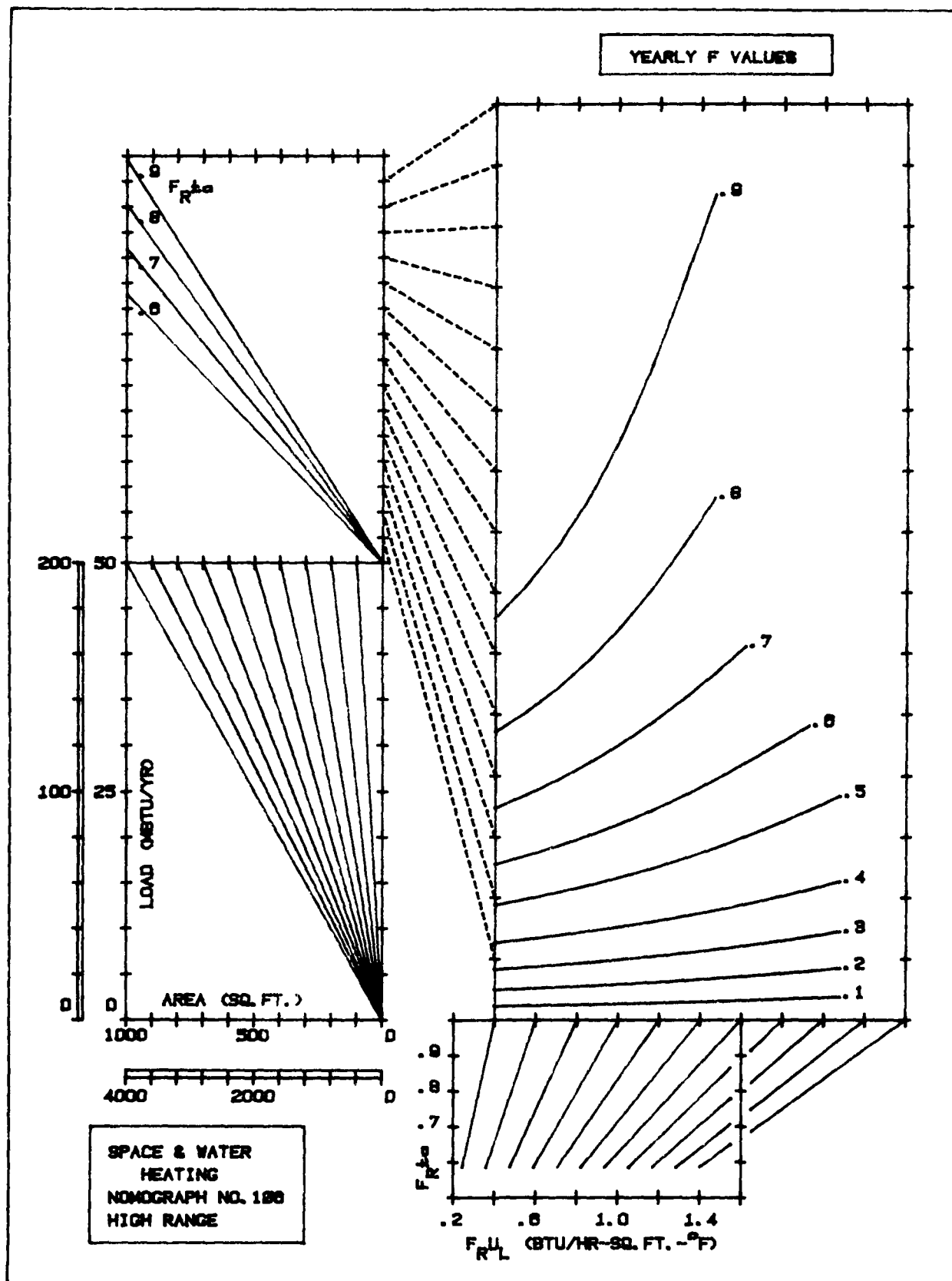




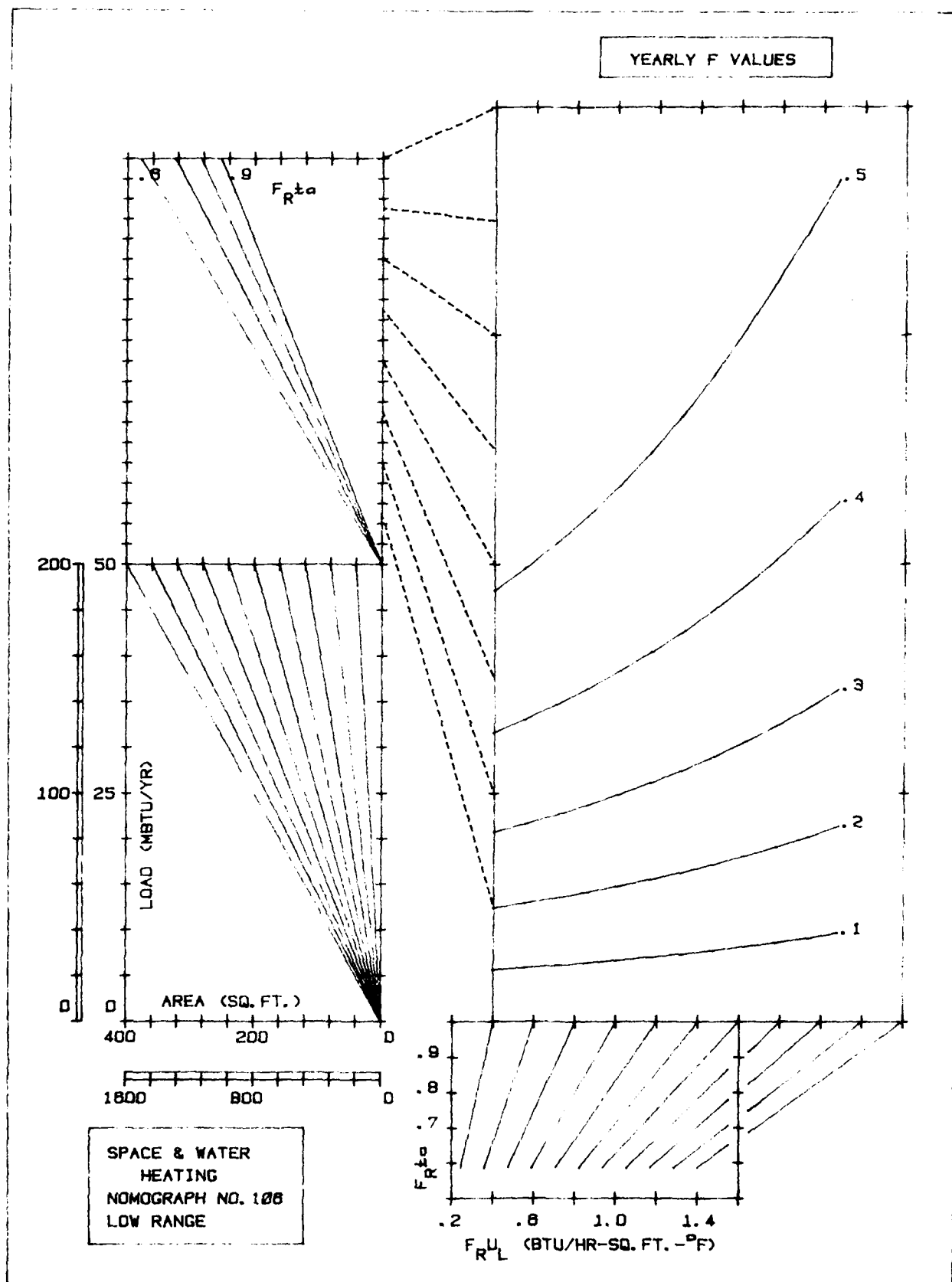


PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

B164

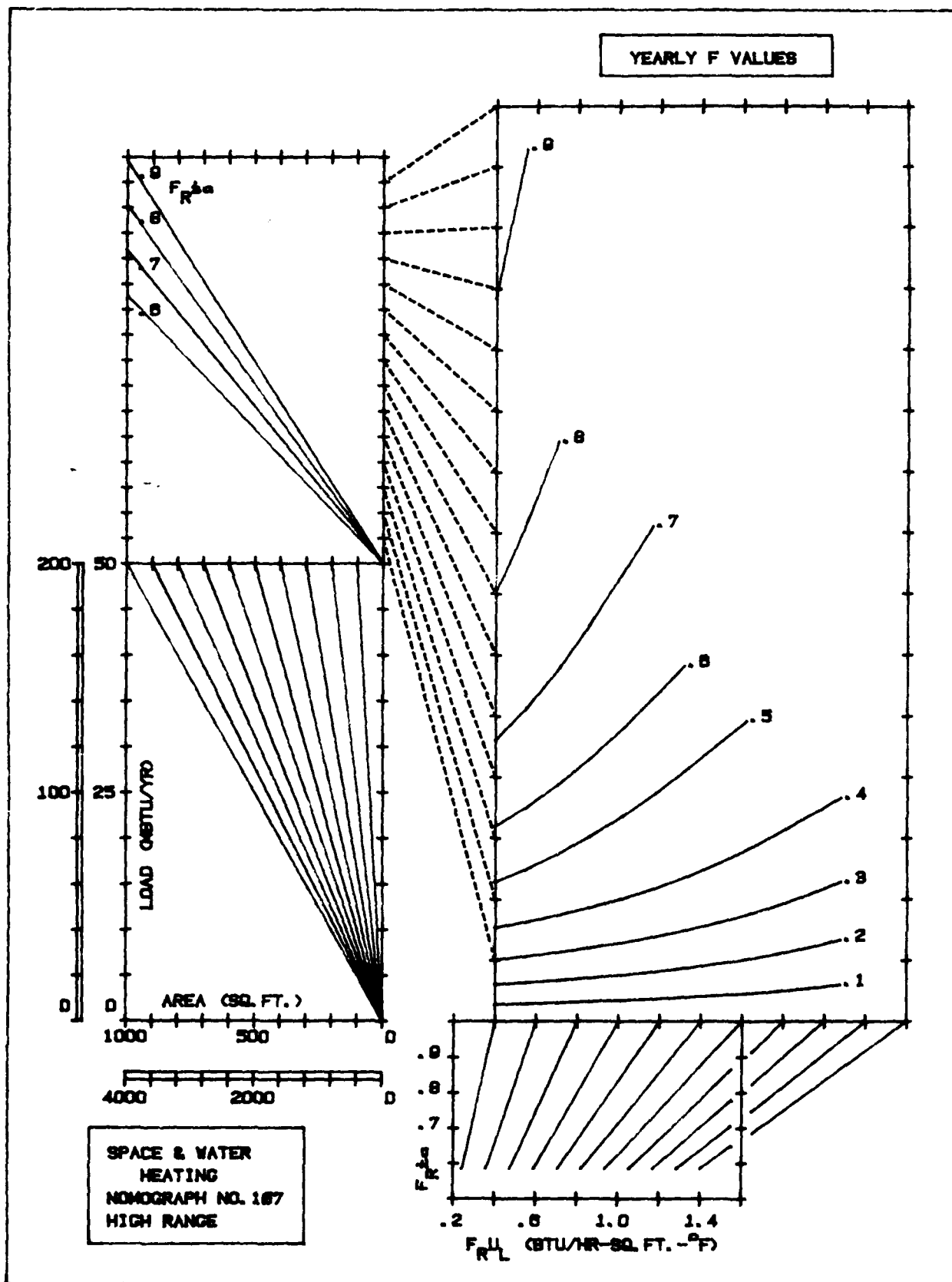


PREPARED 15 JUN 82 FOR AFESC BY USAFA/DFMS



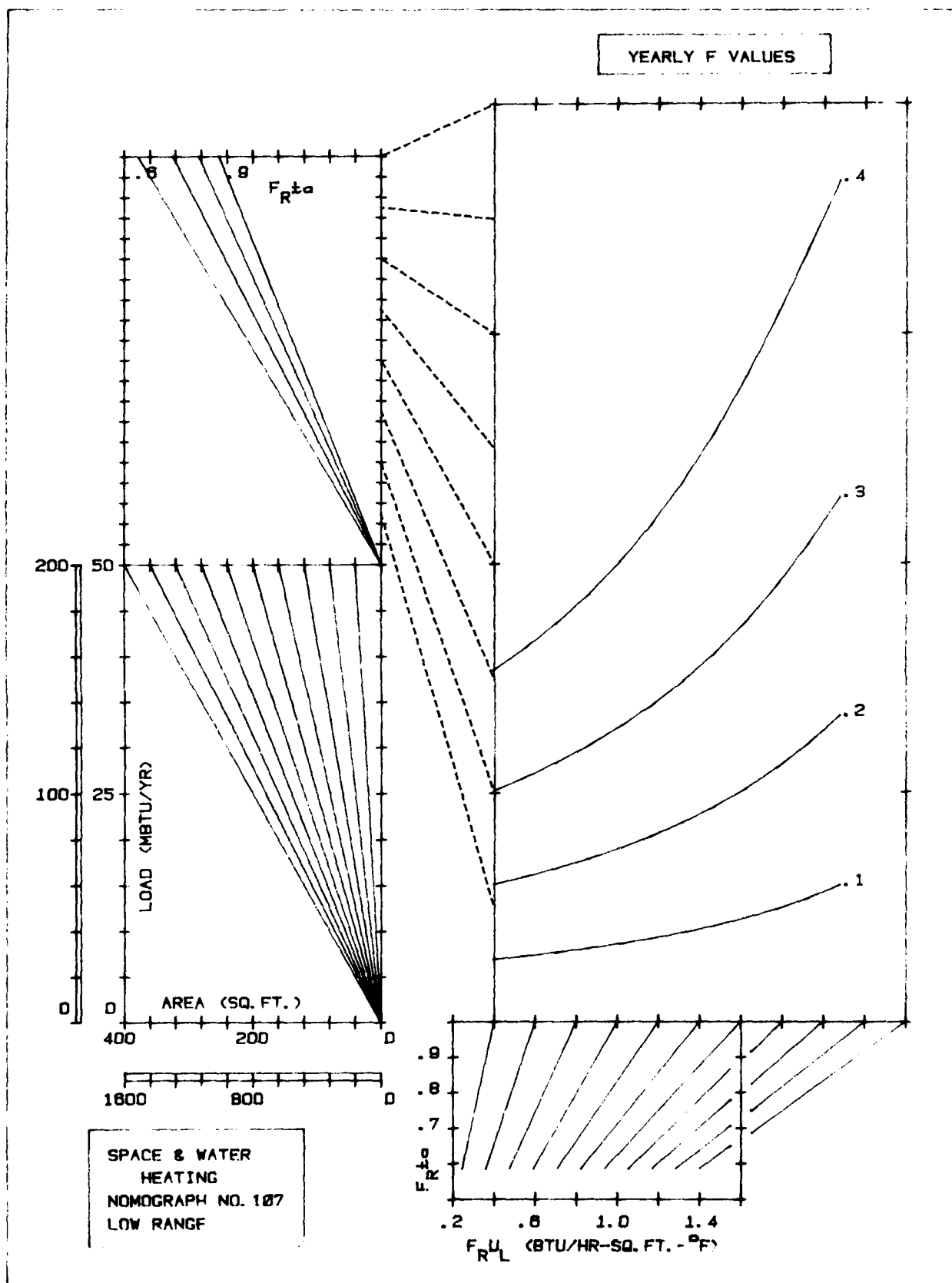
PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

B166



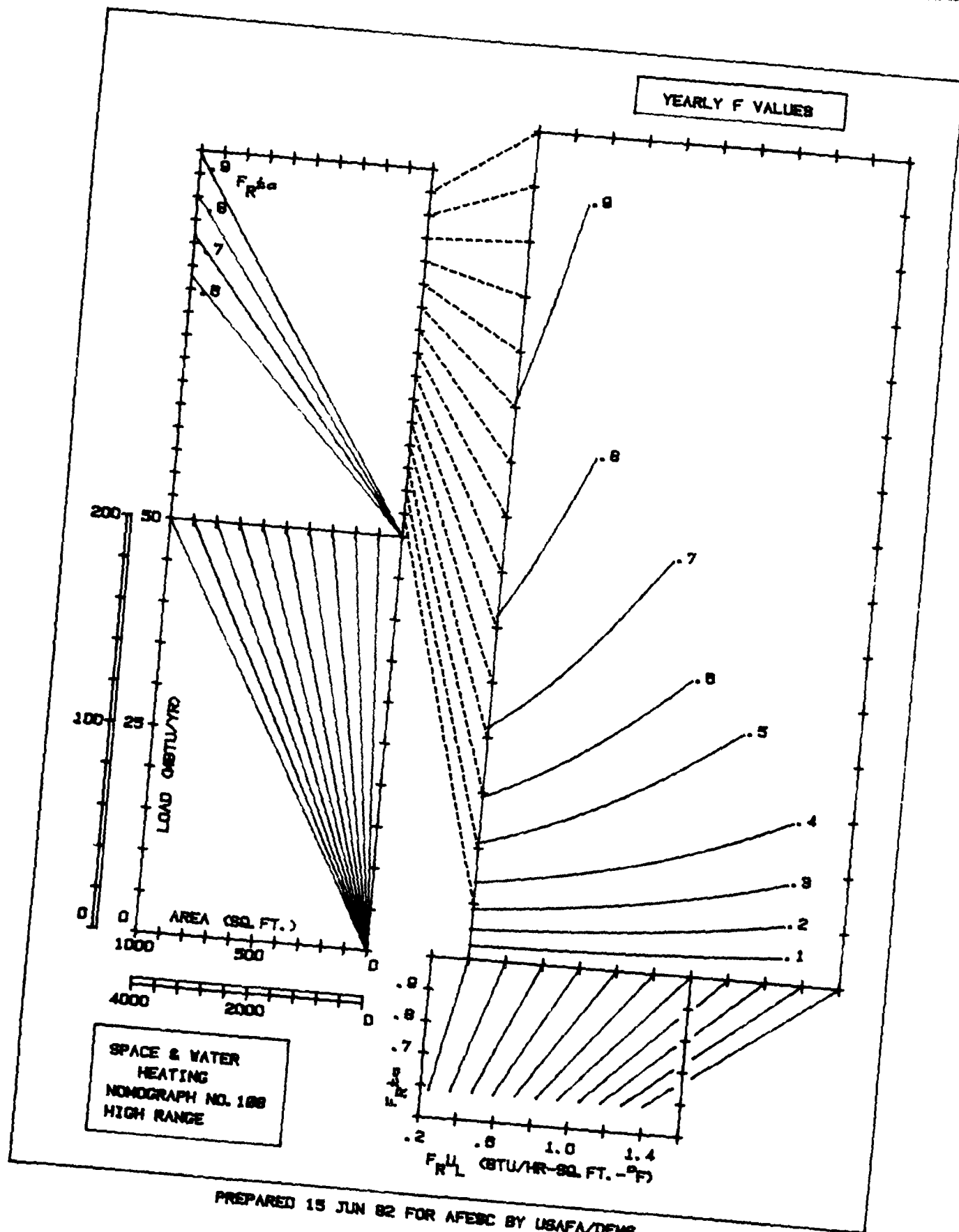
PREPARED 15 JUN 62 FOR AFESC BY USAFA/DFMS

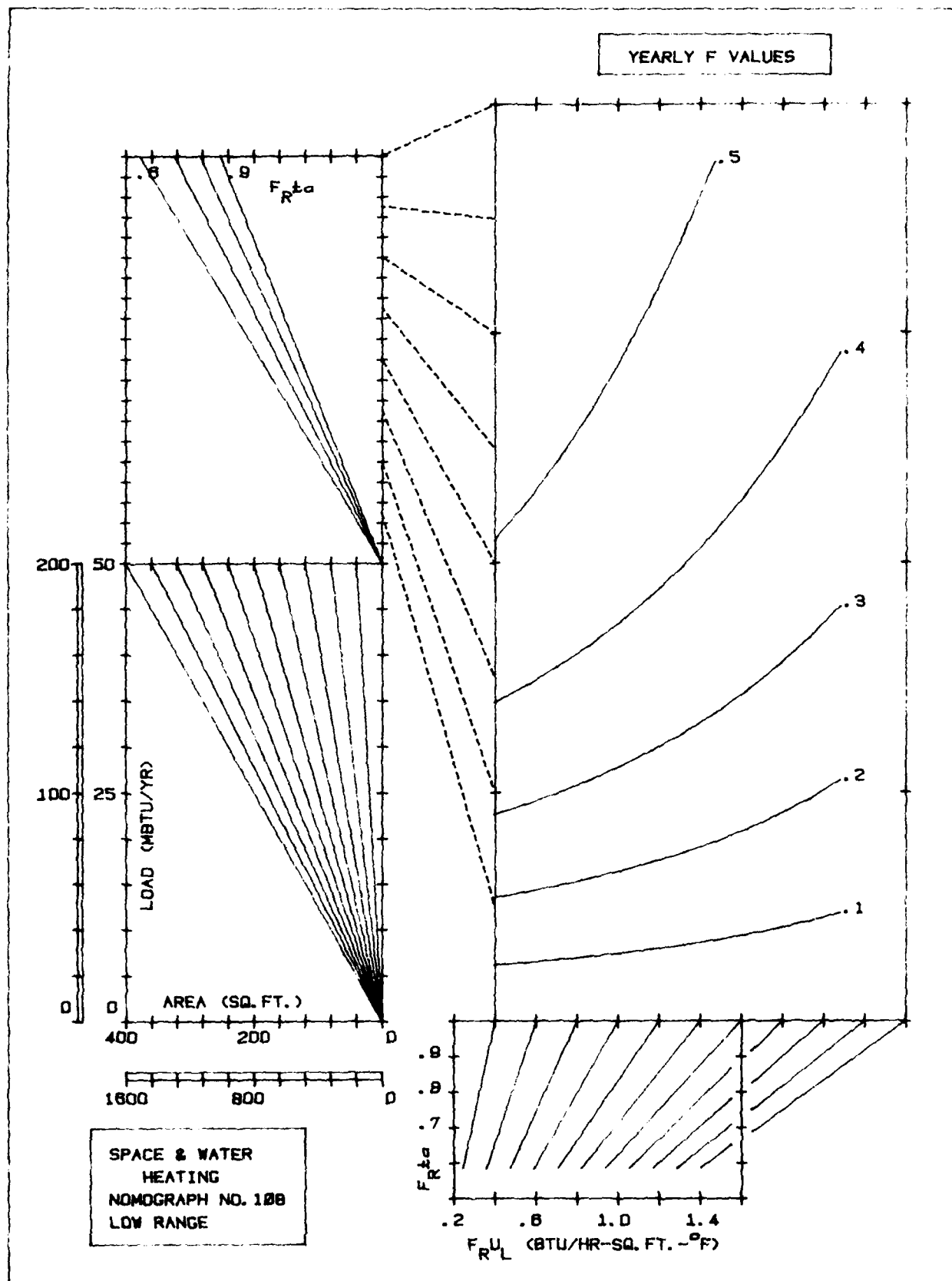
B167



PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

B168

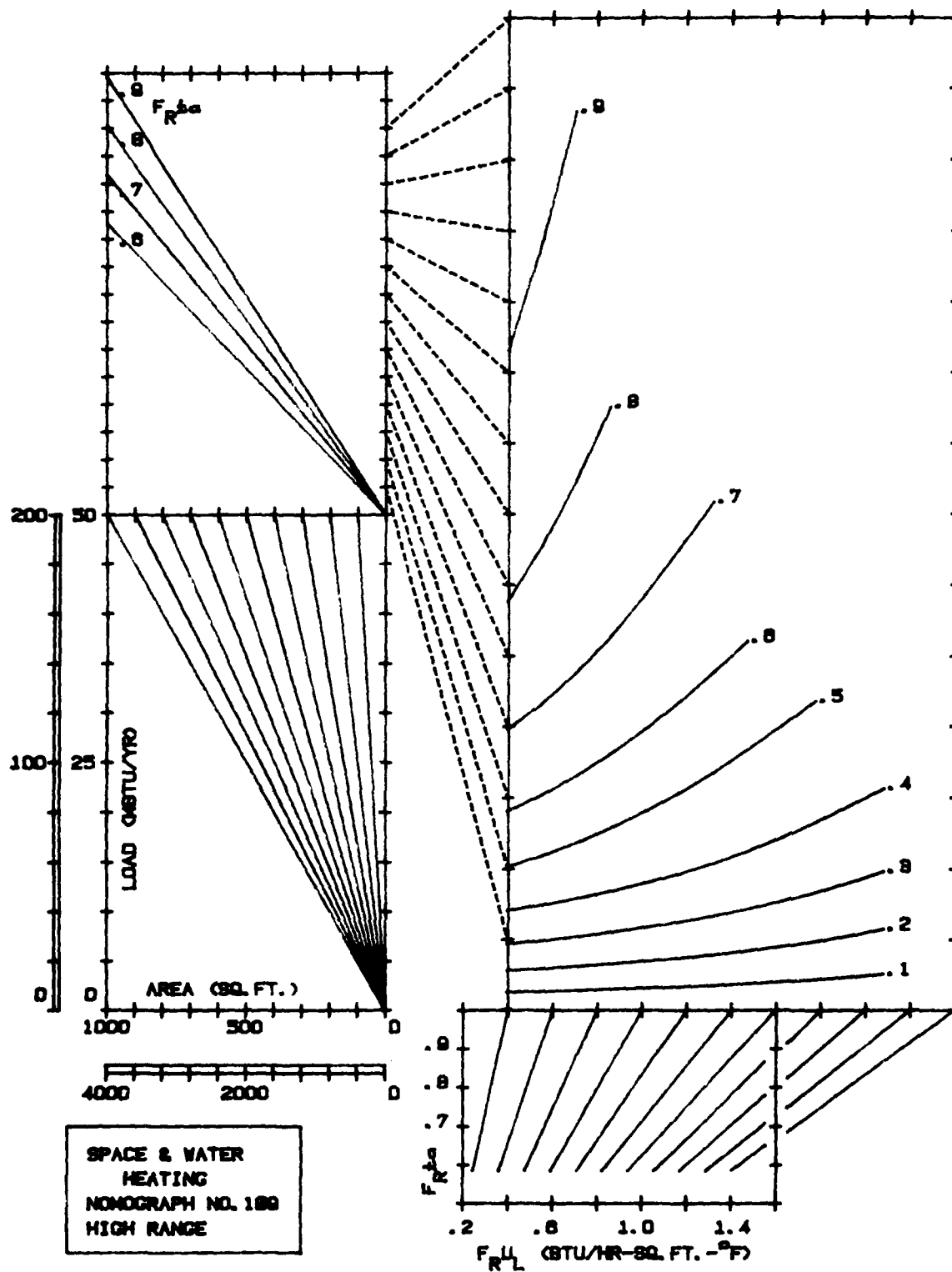




PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

B170

# YEARLY F VALUES

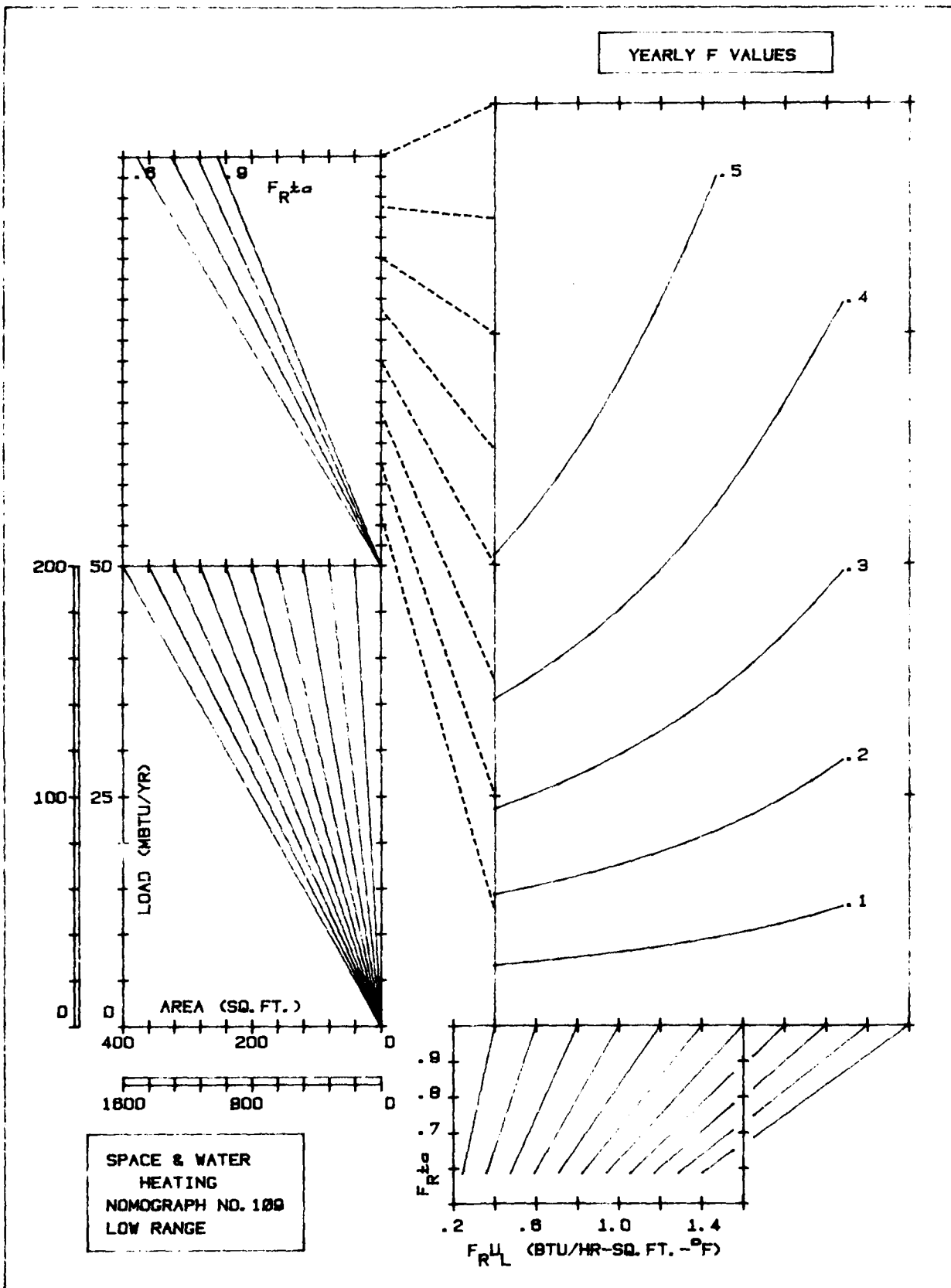


SPACE & WATER  
HEATING  
NOMOGRAPH NO. 189  
HIGH RANGE

PREPARED 15 JUN 62 FOR AFESC BY USAFA/DFMS

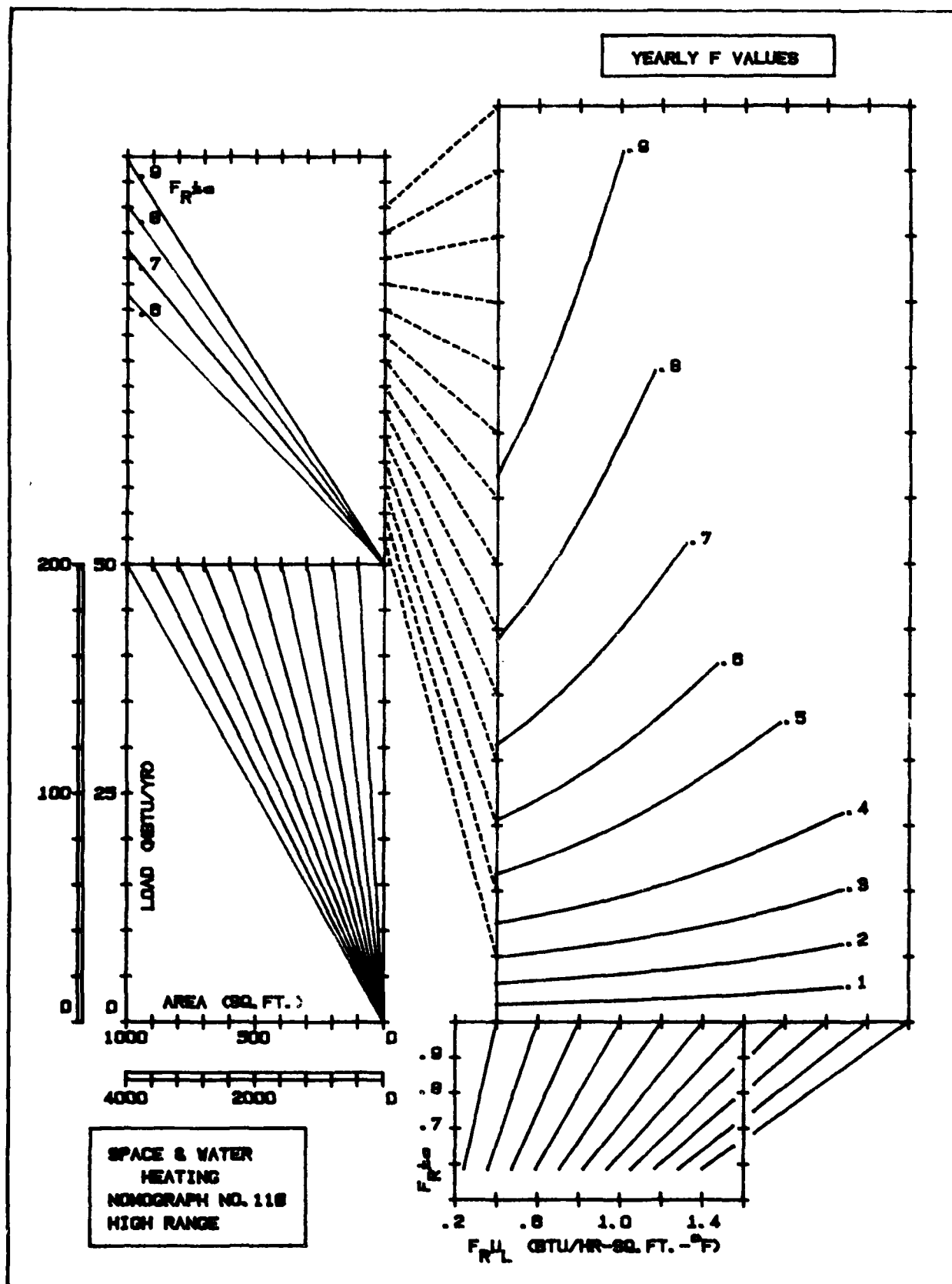
B171



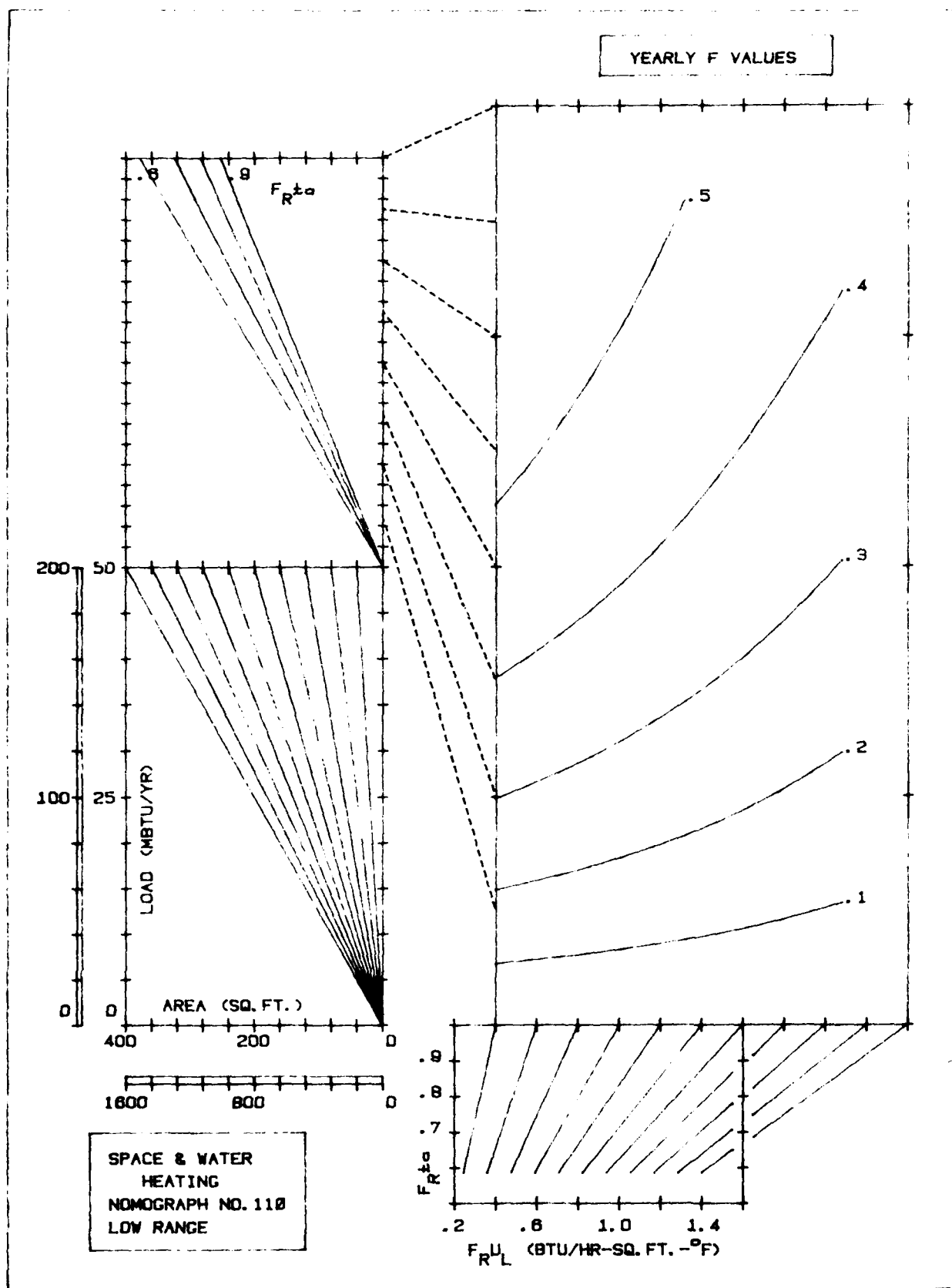


PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

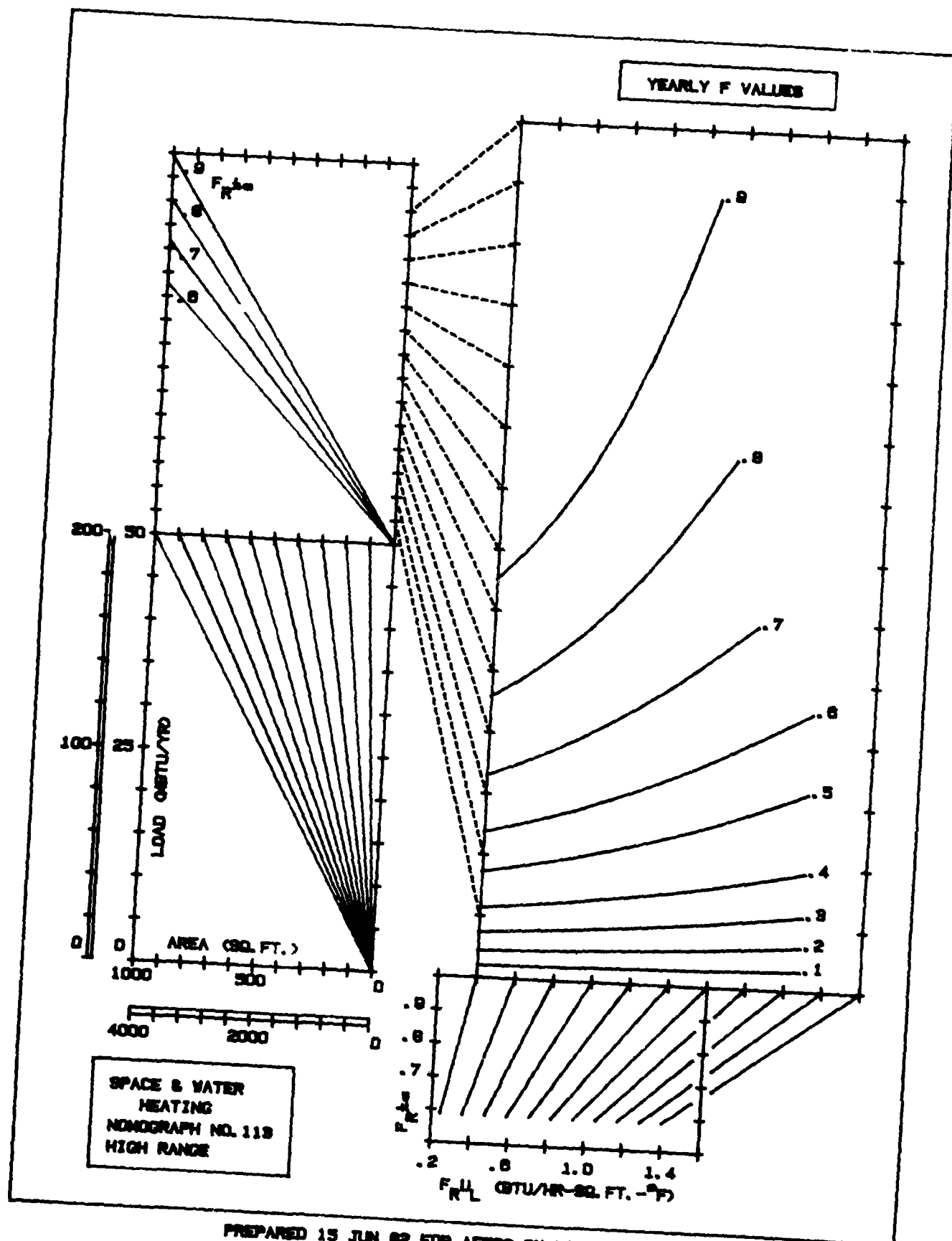
B172

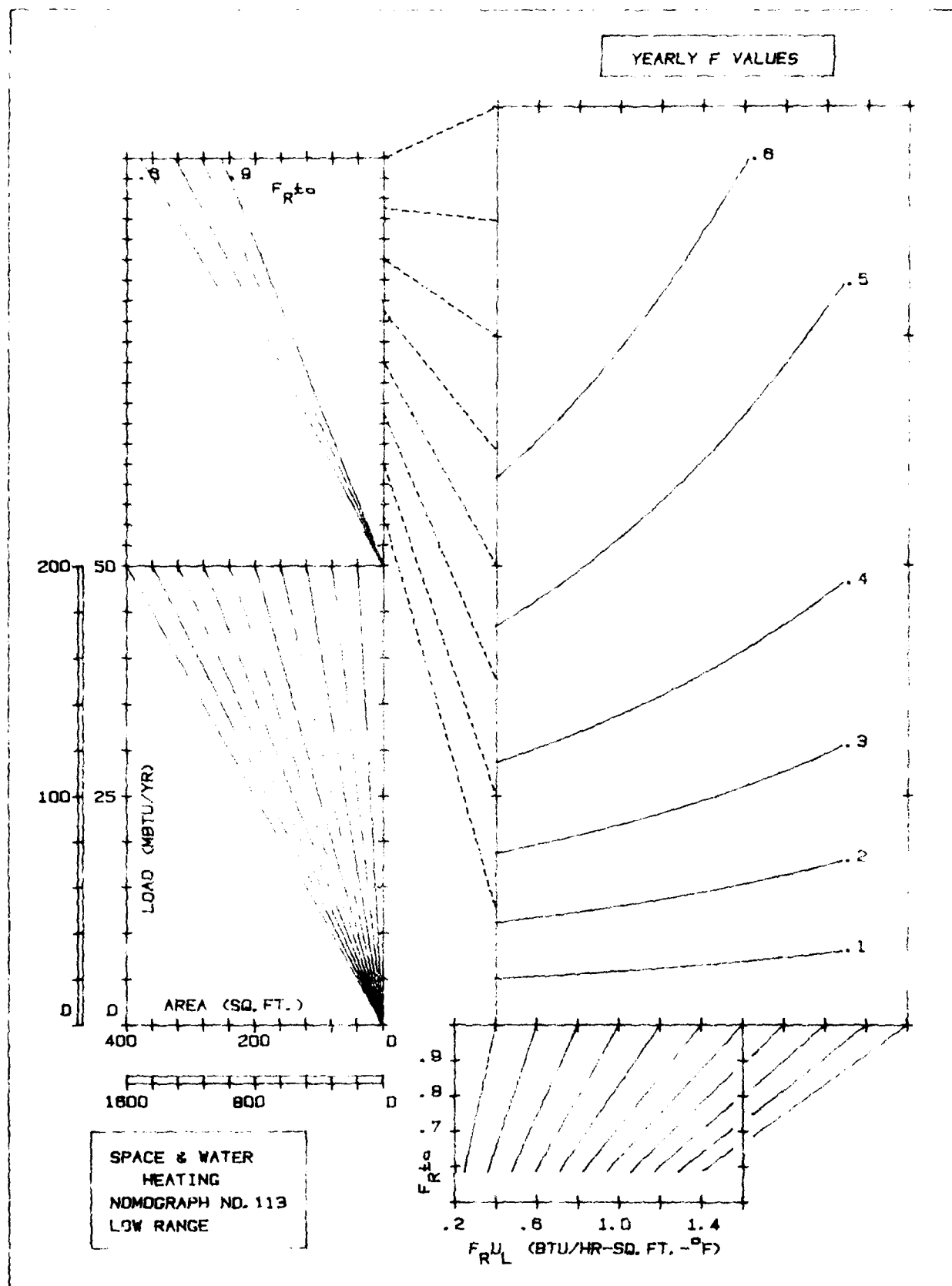


PREPARED 15 JUN 62 FOR AFESC BY USAFA/DFMS

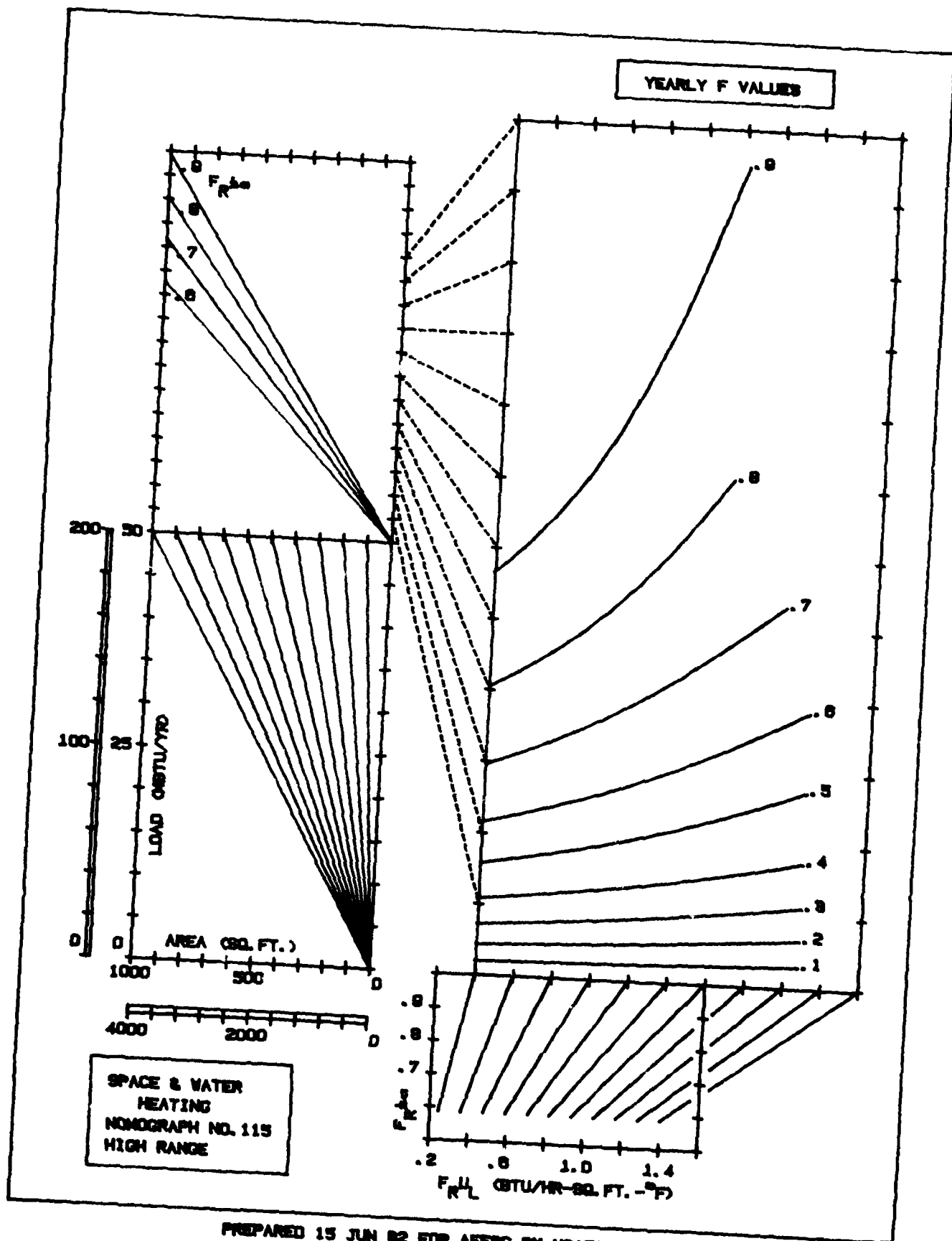


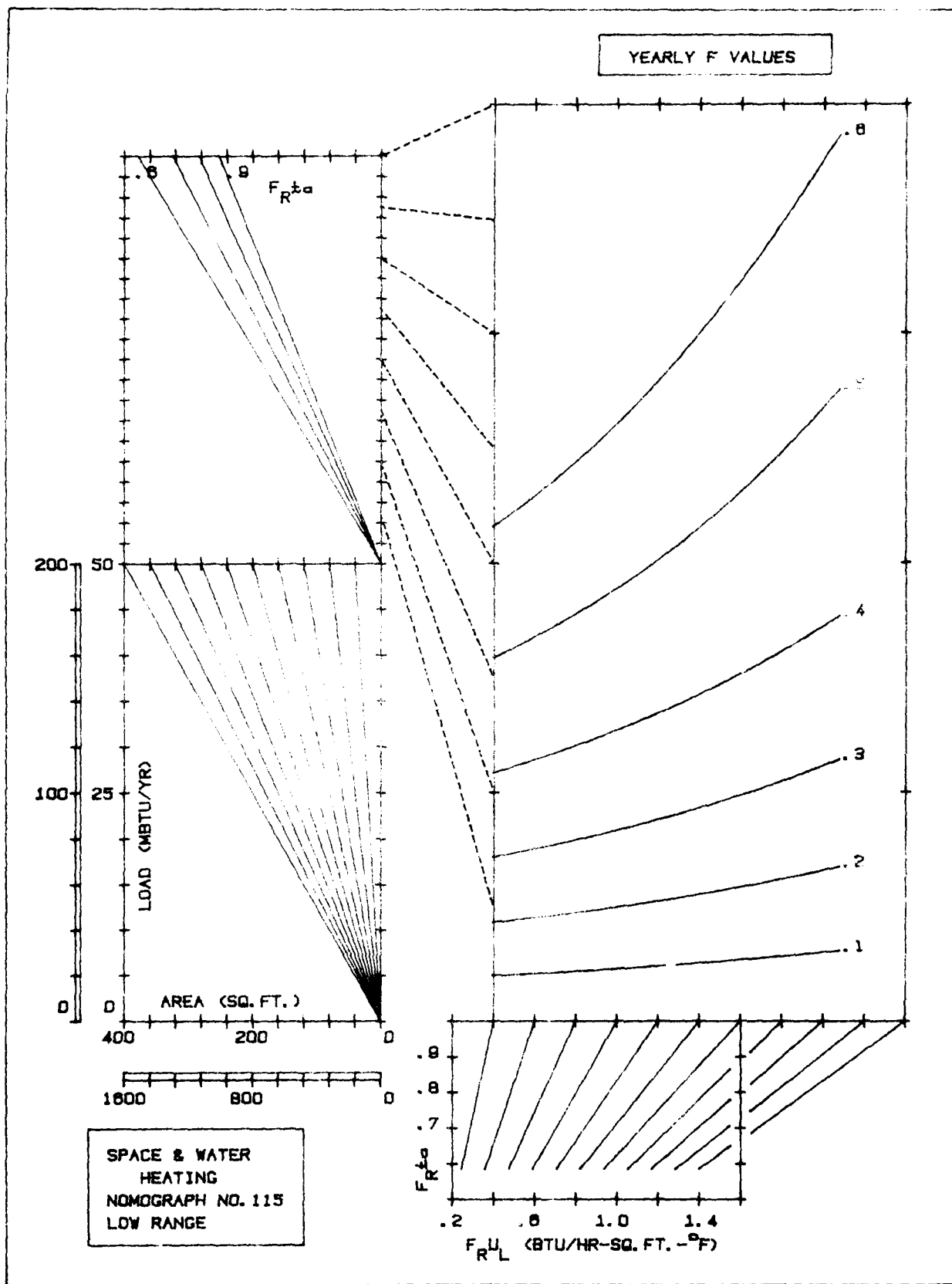
PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS



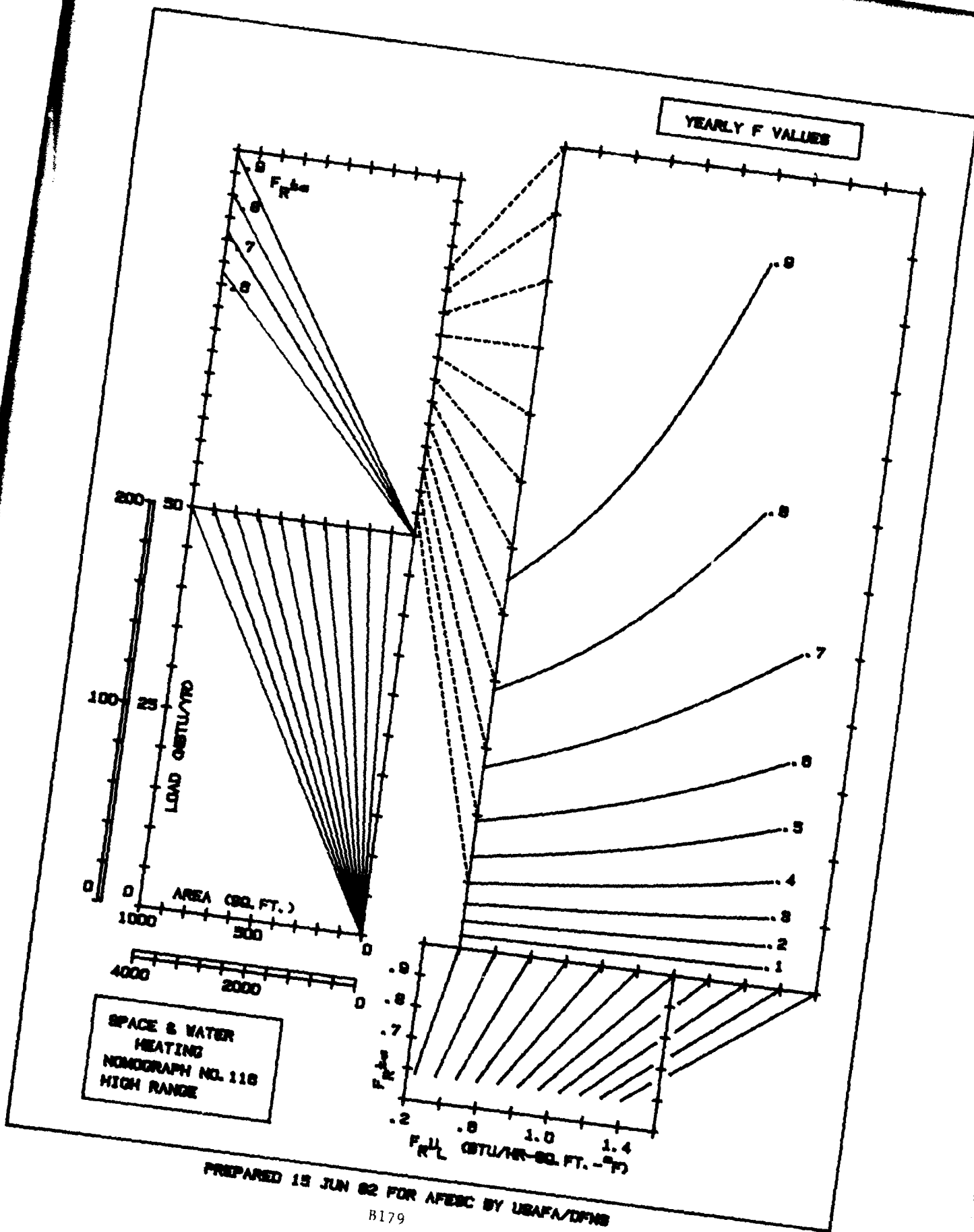


PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS





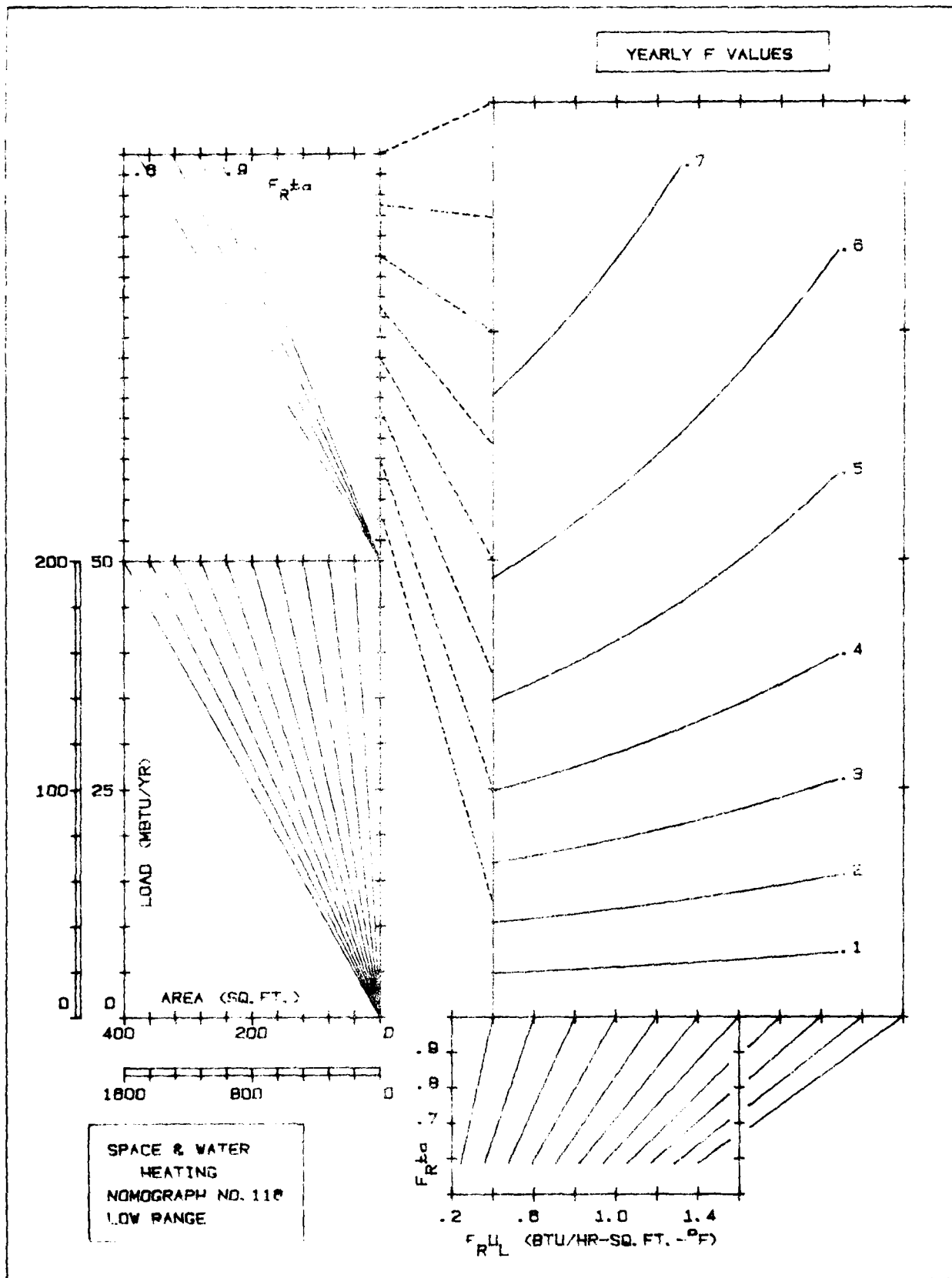
PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS



SPACE & WATER  
HEATING  
NOMOGRAPH NO. 118  
HIGH RANGE

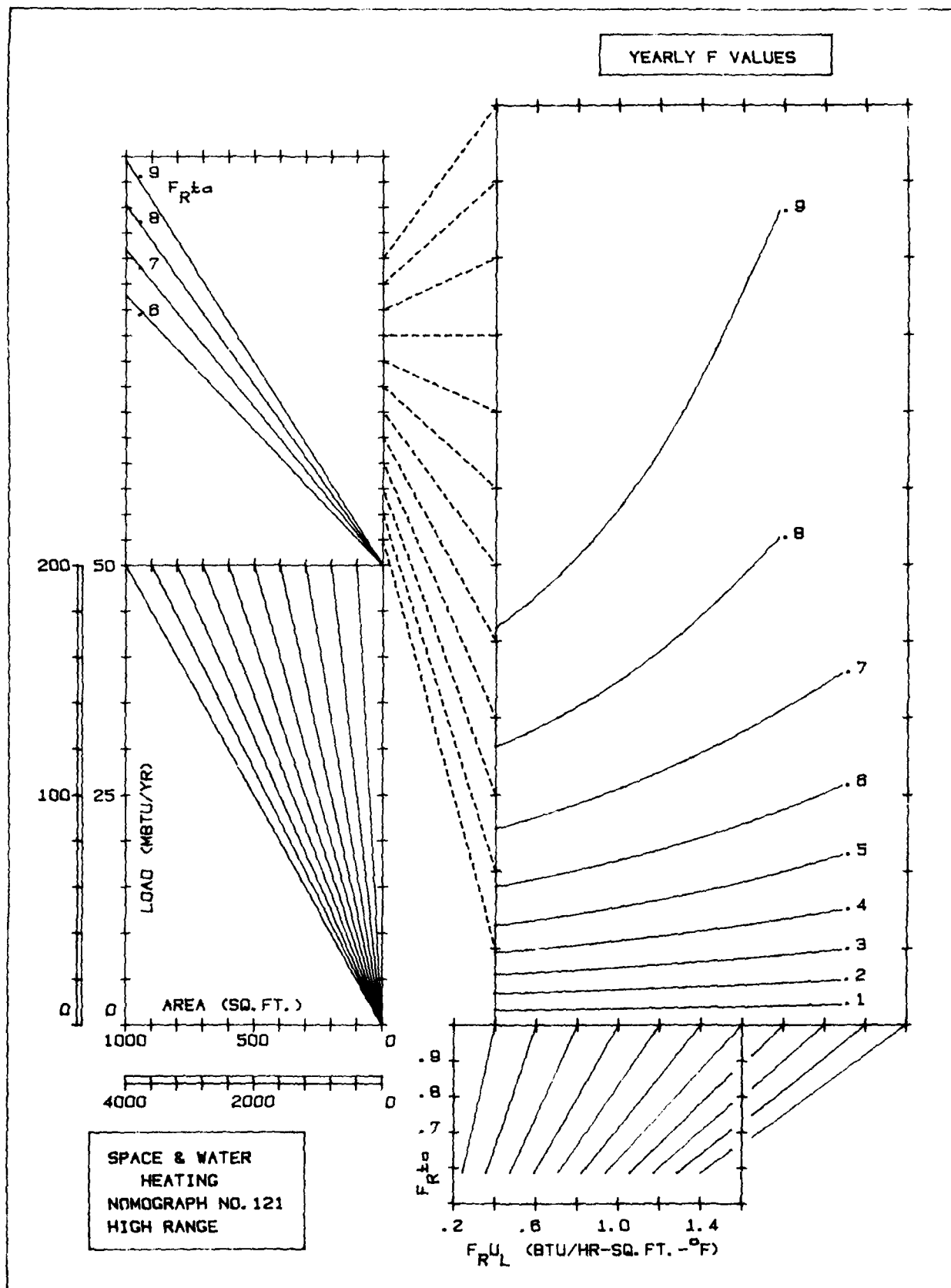
PREPARED 15 JUN 82 FOR AFESC BY USAFA/DFMS  
B179





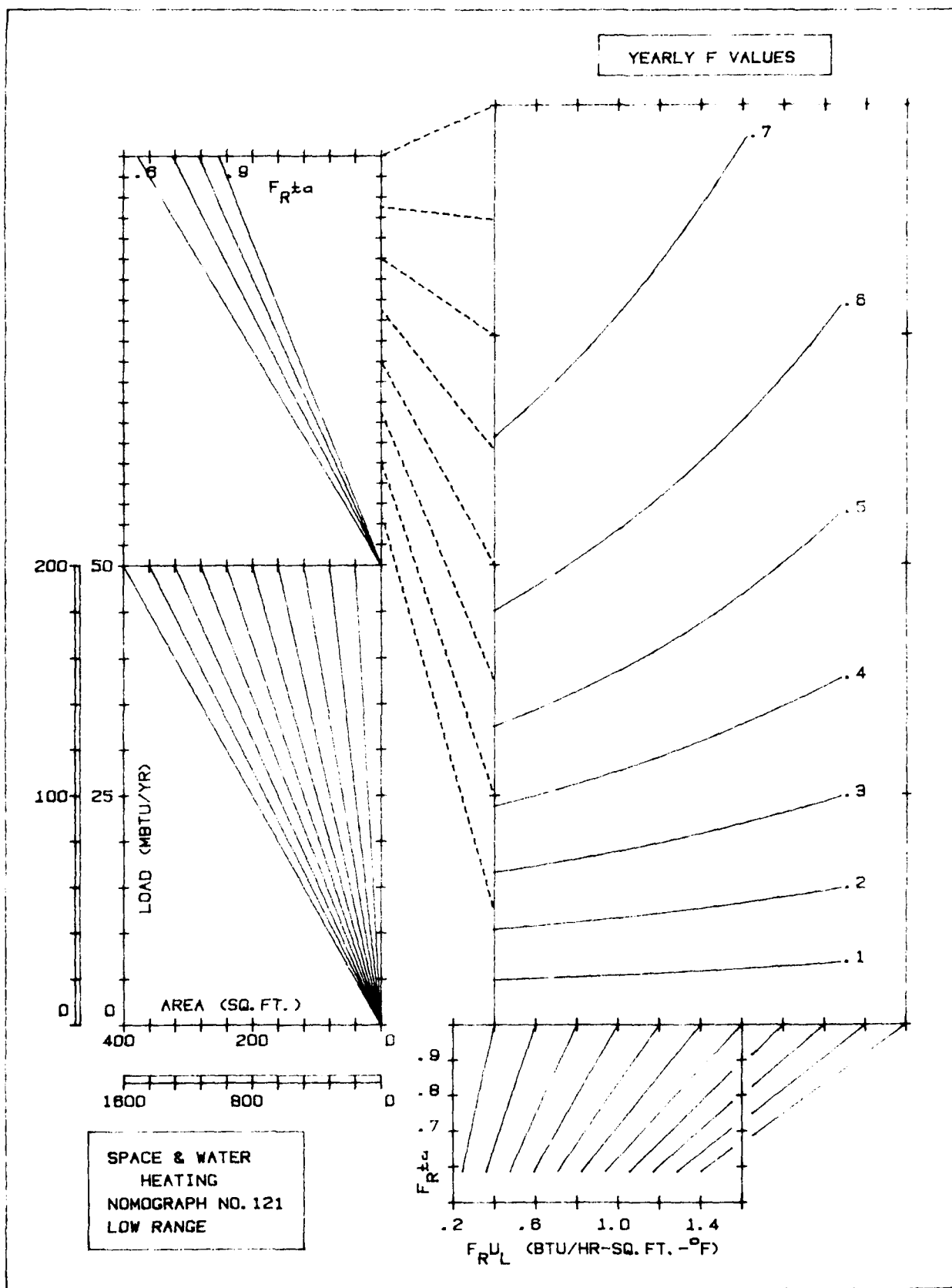
PREPARED 08 JUL 82 FOR AFESC BY USAFA/DFMS

WTR



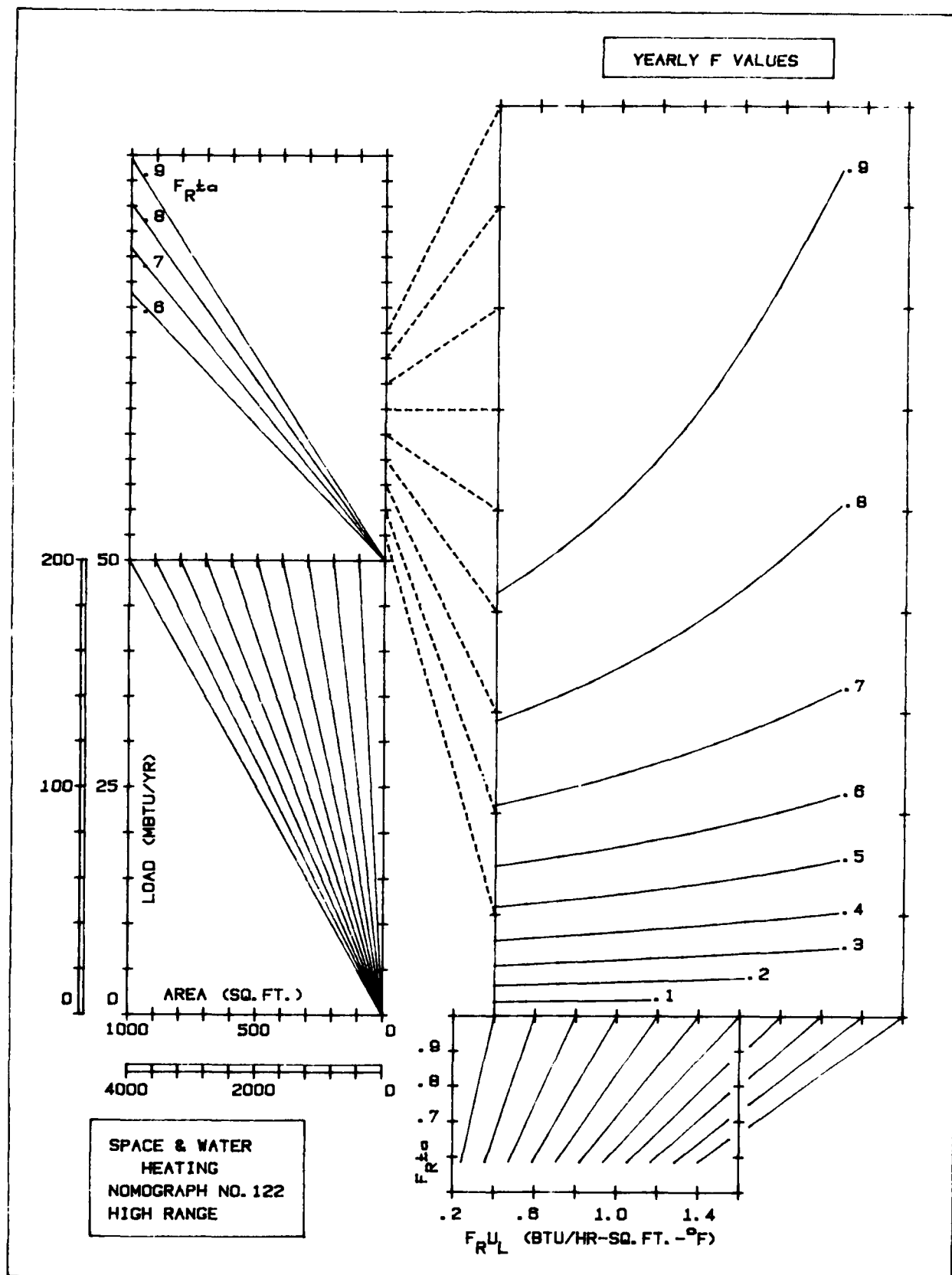
PREPARED 19 JUL 82 FOR AFESC BY USAFA/DFMS

B181

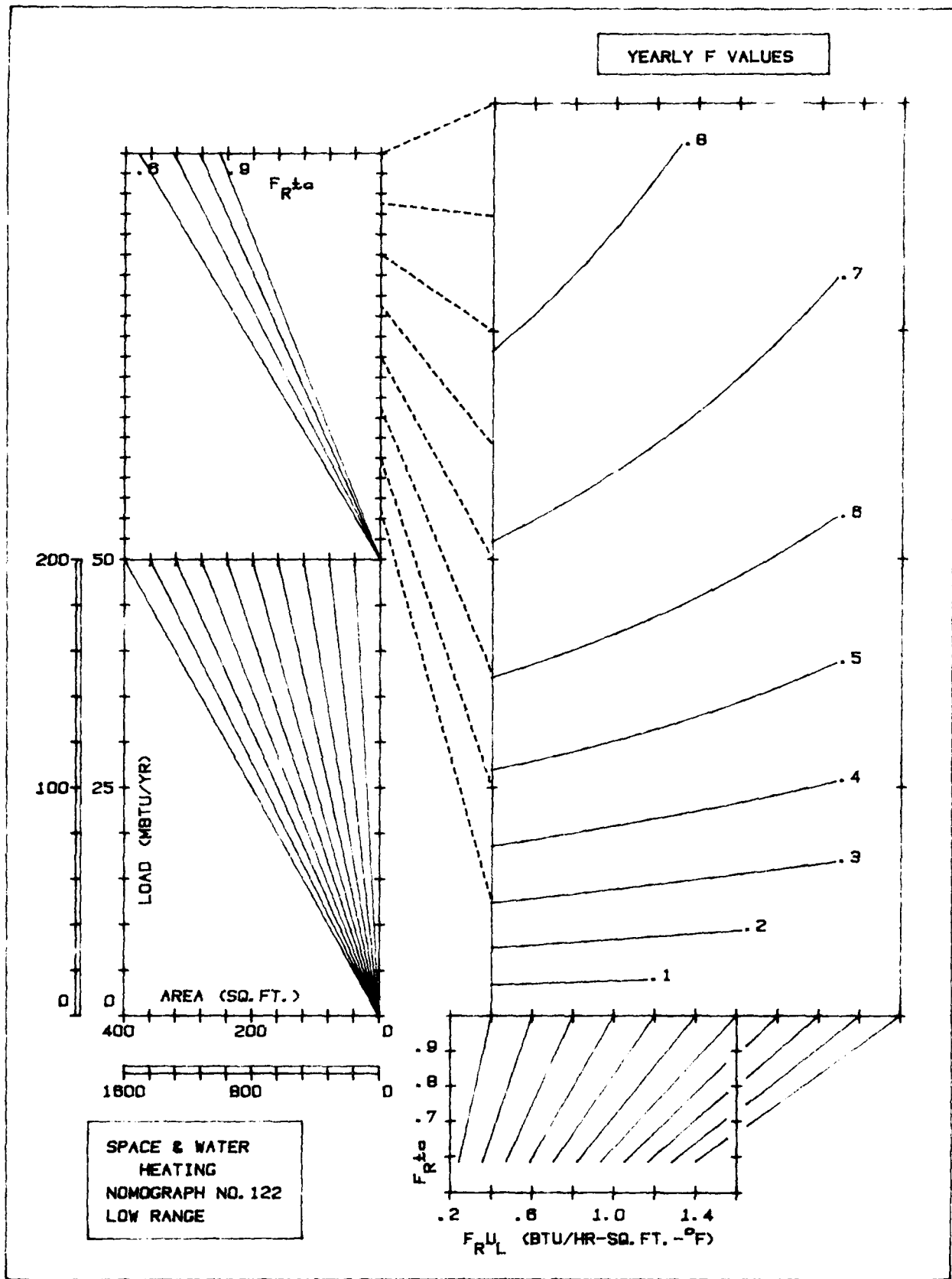


PREPARED 19 JUL 82 FOR AFESC BY USAFA/DFMS

B182



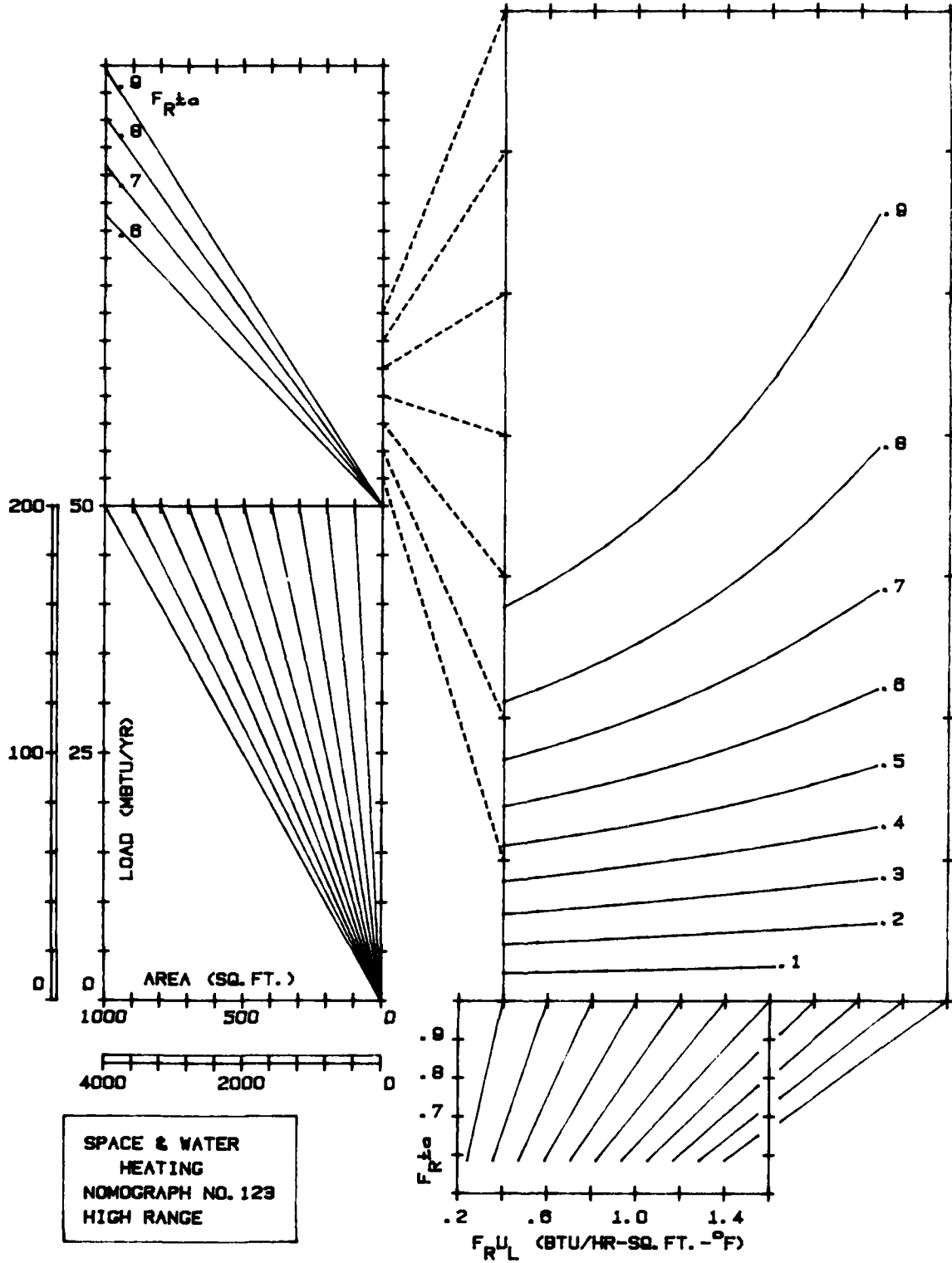
PREPARED 19 JUL 82 FOR AFESC BY USAFA/DFMS



PREPARED 19 JUL 82 FOR AFESC BY USAFA/DFMS

B184

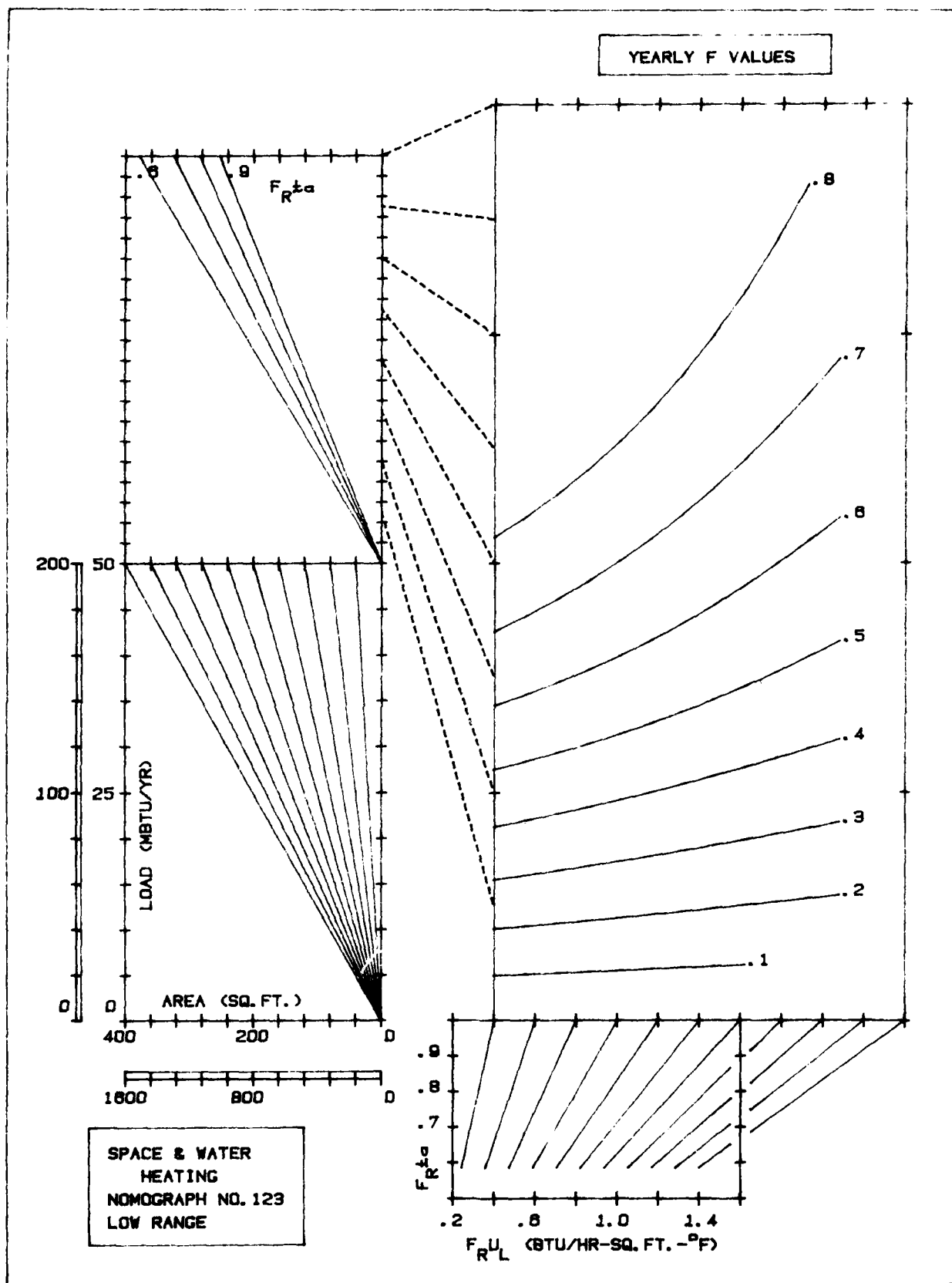
# YEARLY F VALUES



SPACE & WATER  
HEATING  
NOMOGRAPH NO. 123  
HIGH RANGE

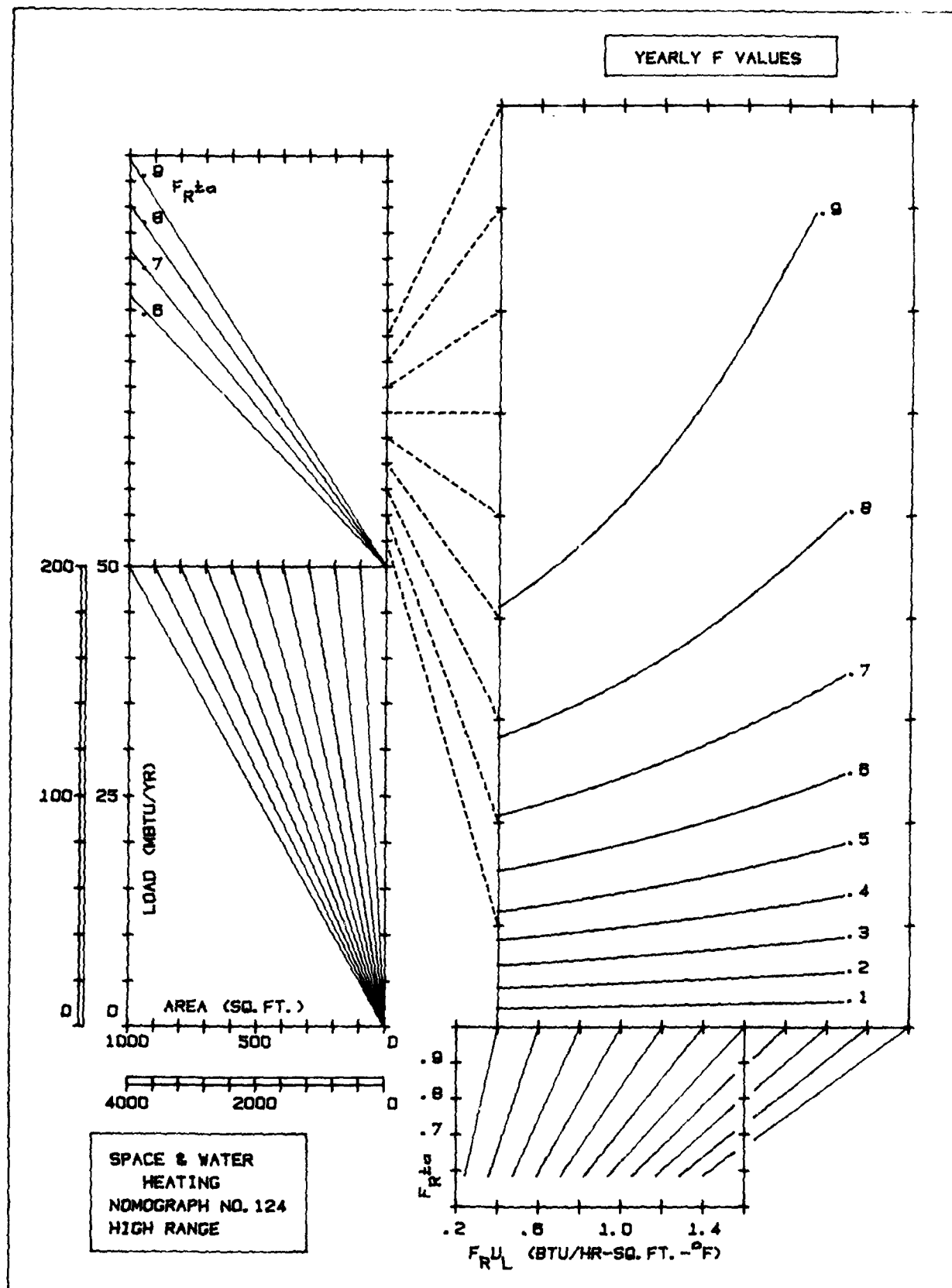
PREPARED 19 JUL 82 FOR AFESC BY USAFA/DFMS

B185



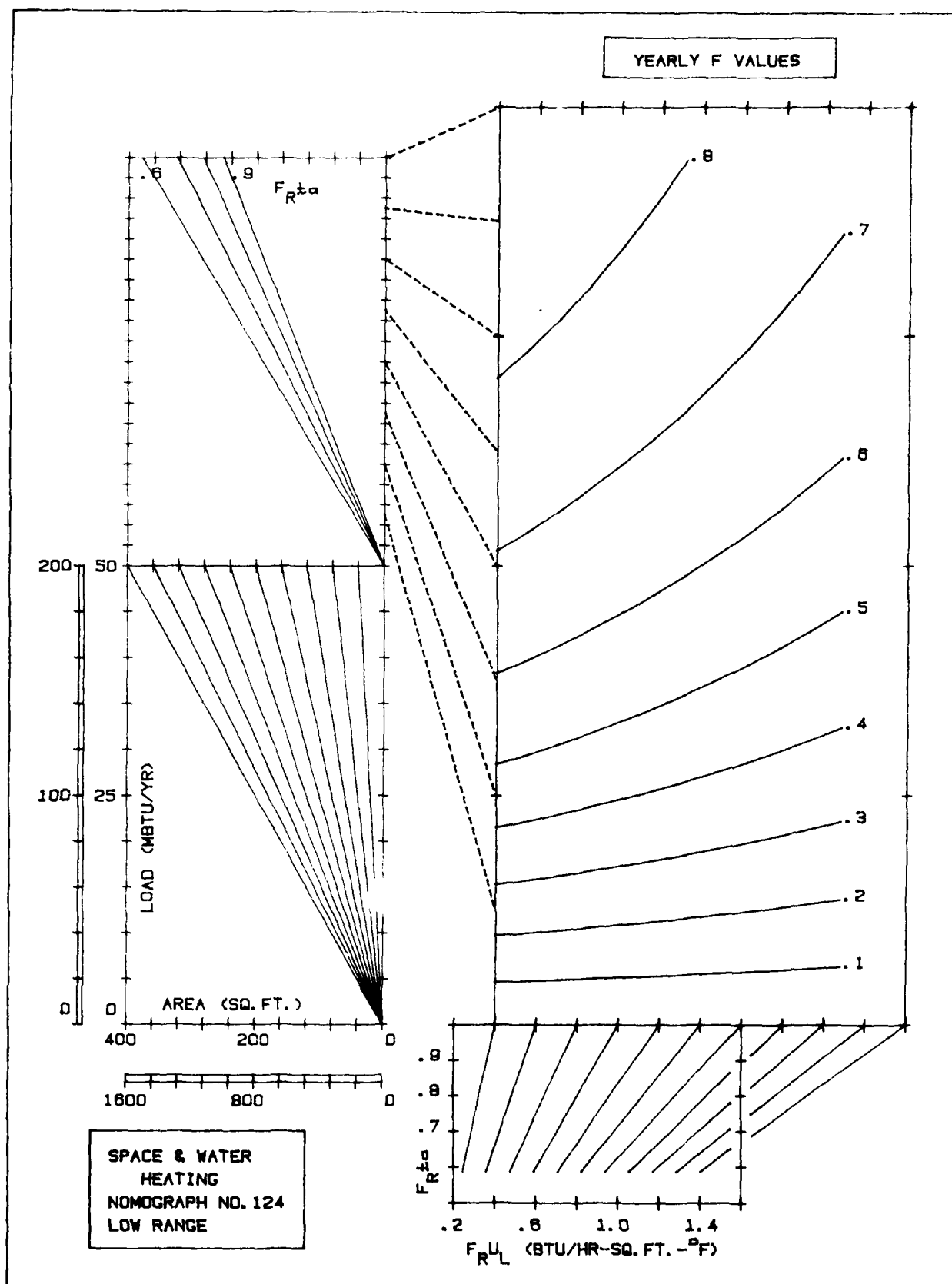
PREPARED 19 JUL 82 FOR AFESC BY USAFA/DFMS

B186



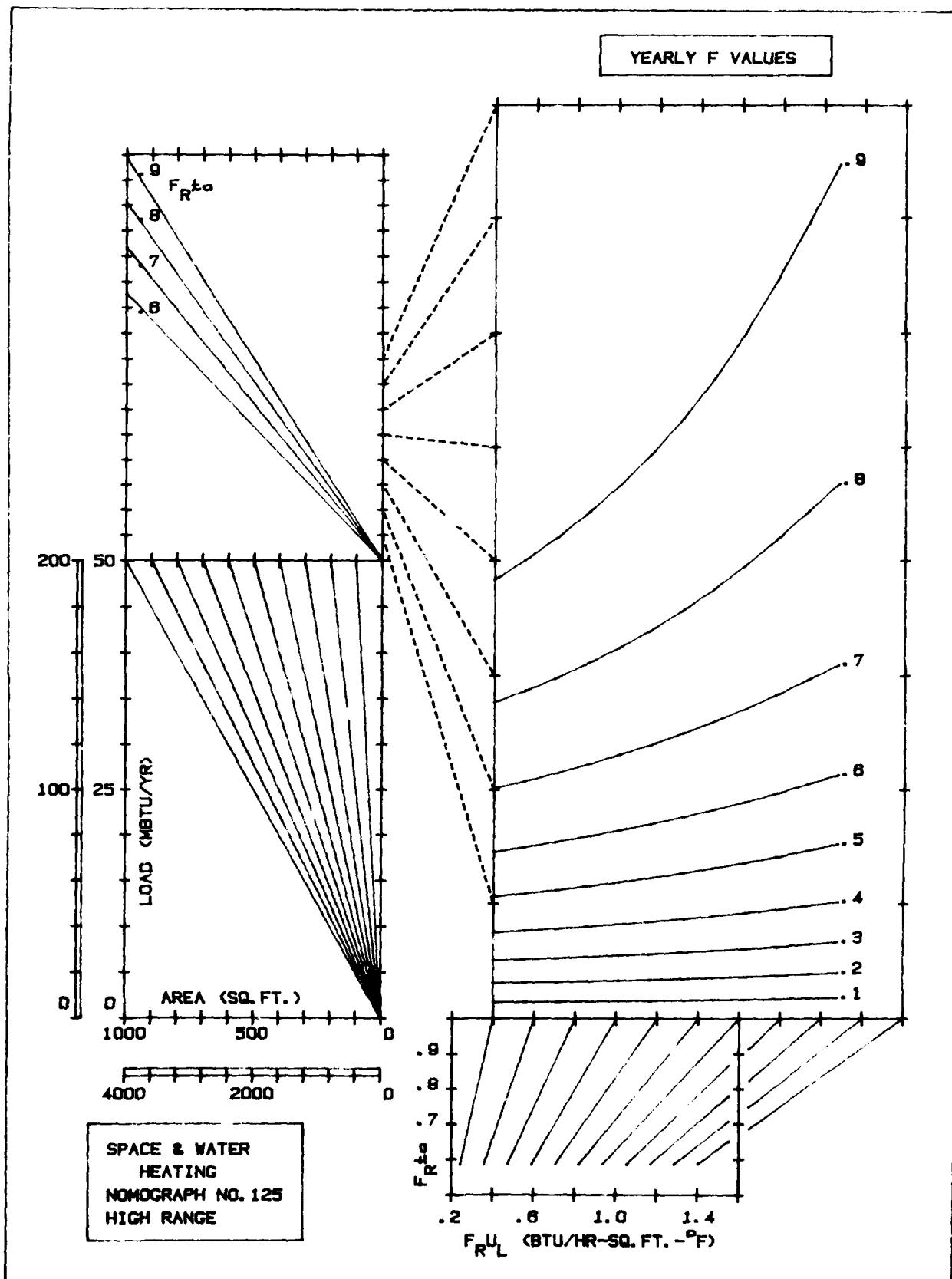
PREPARED 21 JUL 82 FOR AFESC BY USAFA/DFMS





PREPARED 21 JUL 82 FOR AFESC BY USAFA/DFMS

B188



PREPARED 21 JUL 82 FOR AFESC BY USAFA/DFMS

AD-A120 014

AIR FORCE ACADEMY CO  
SIMPLIFIED SOLAR FRACTION ESTIMATION FOR SPACE AND WATER HEATIN--ETC(U)  
SEP 82 N S PACHECO, D G KNIOLA, J F SHEEDY  
UNCLASSIFIED USAFA-TR-82-6-APP-C

F/G 13/1

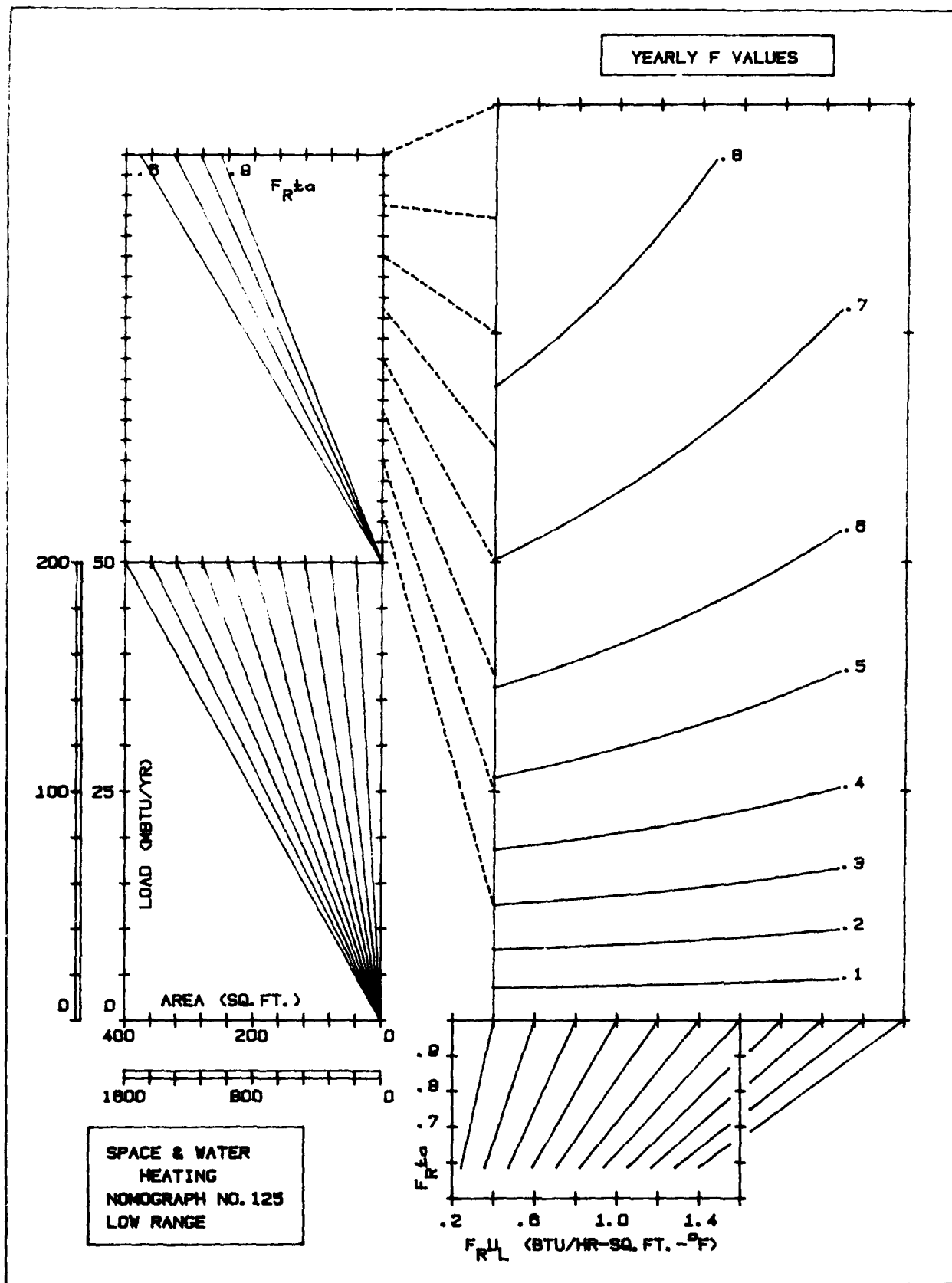
NL

3 of 3

40 8  
120014

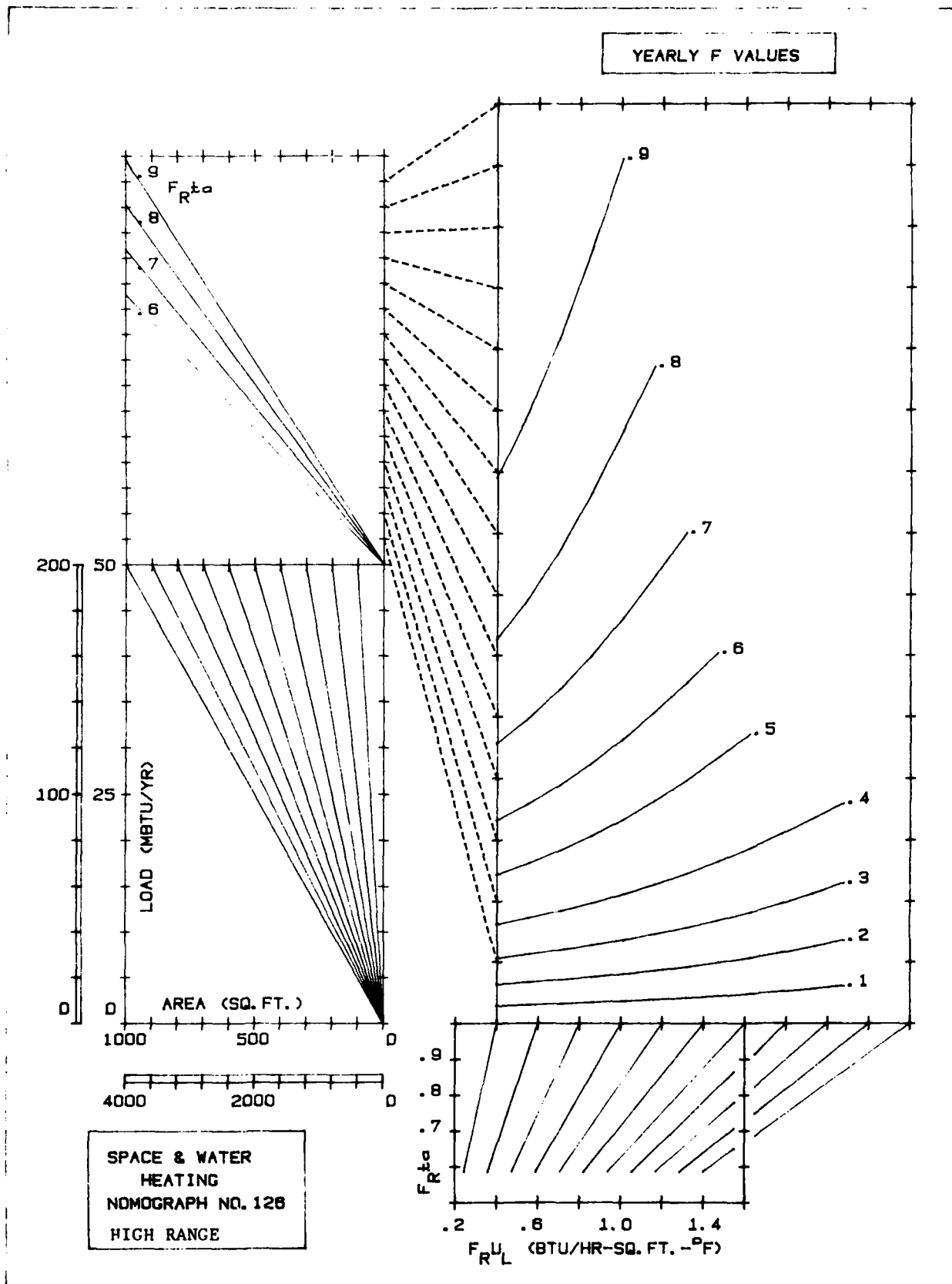


END  
DATE  
FILMED  
11 88  
DTIC

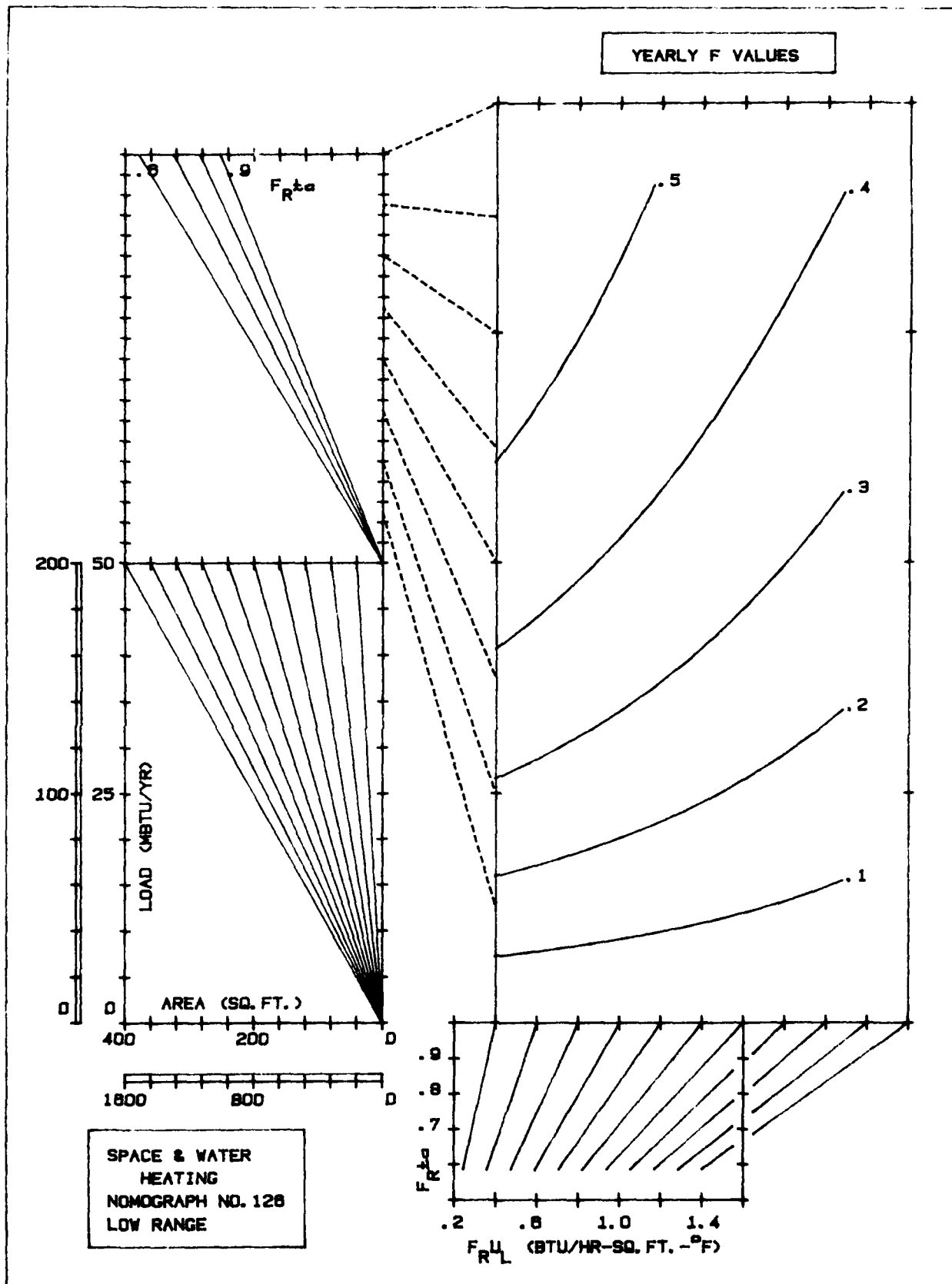


PREPARED 21 JUL 62 FOR AFESC BY USAFA/DFMS

B190

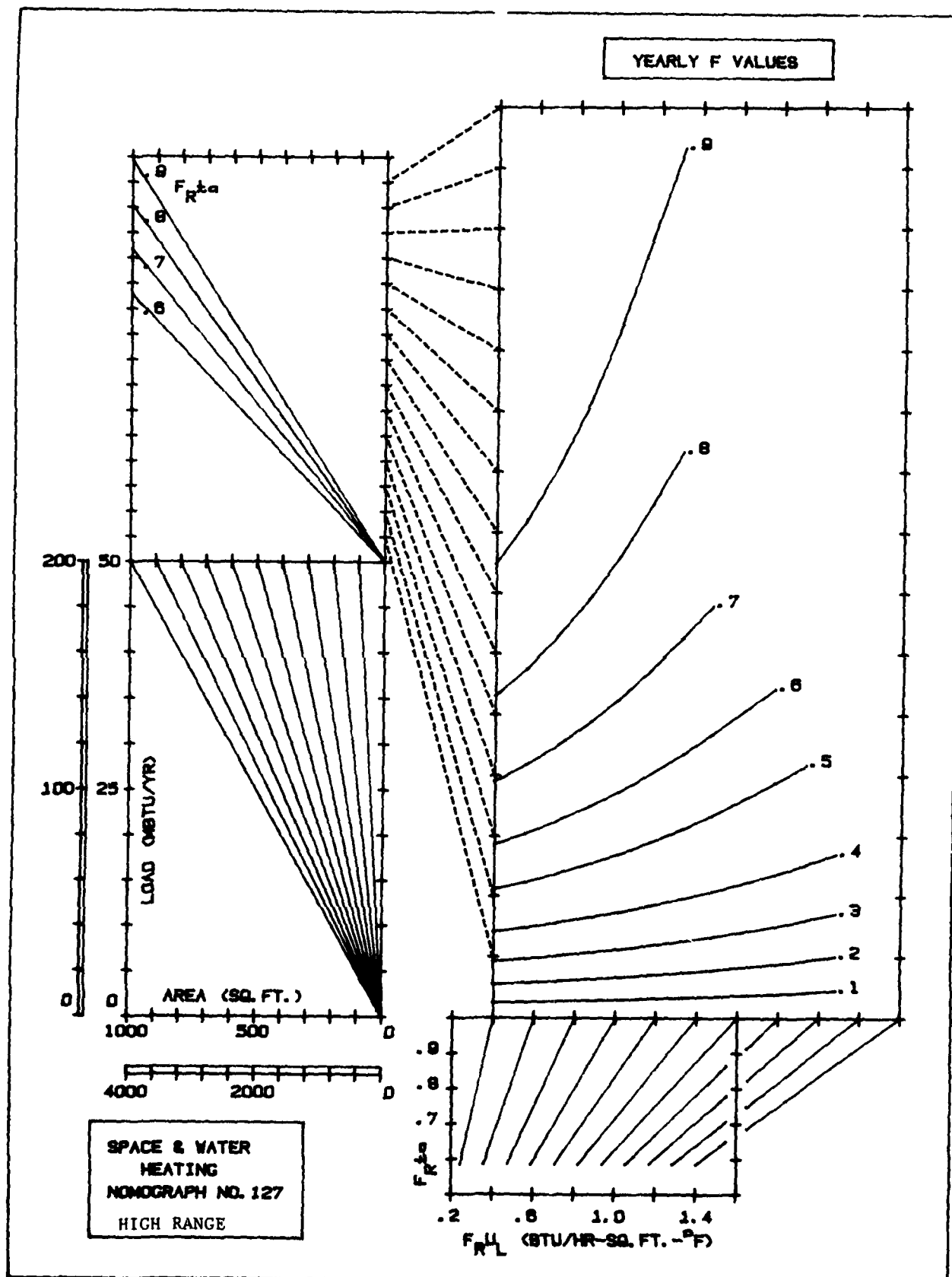


PREPARED 22 JUL 82 FOR AFESC BY USAFA/DFMS

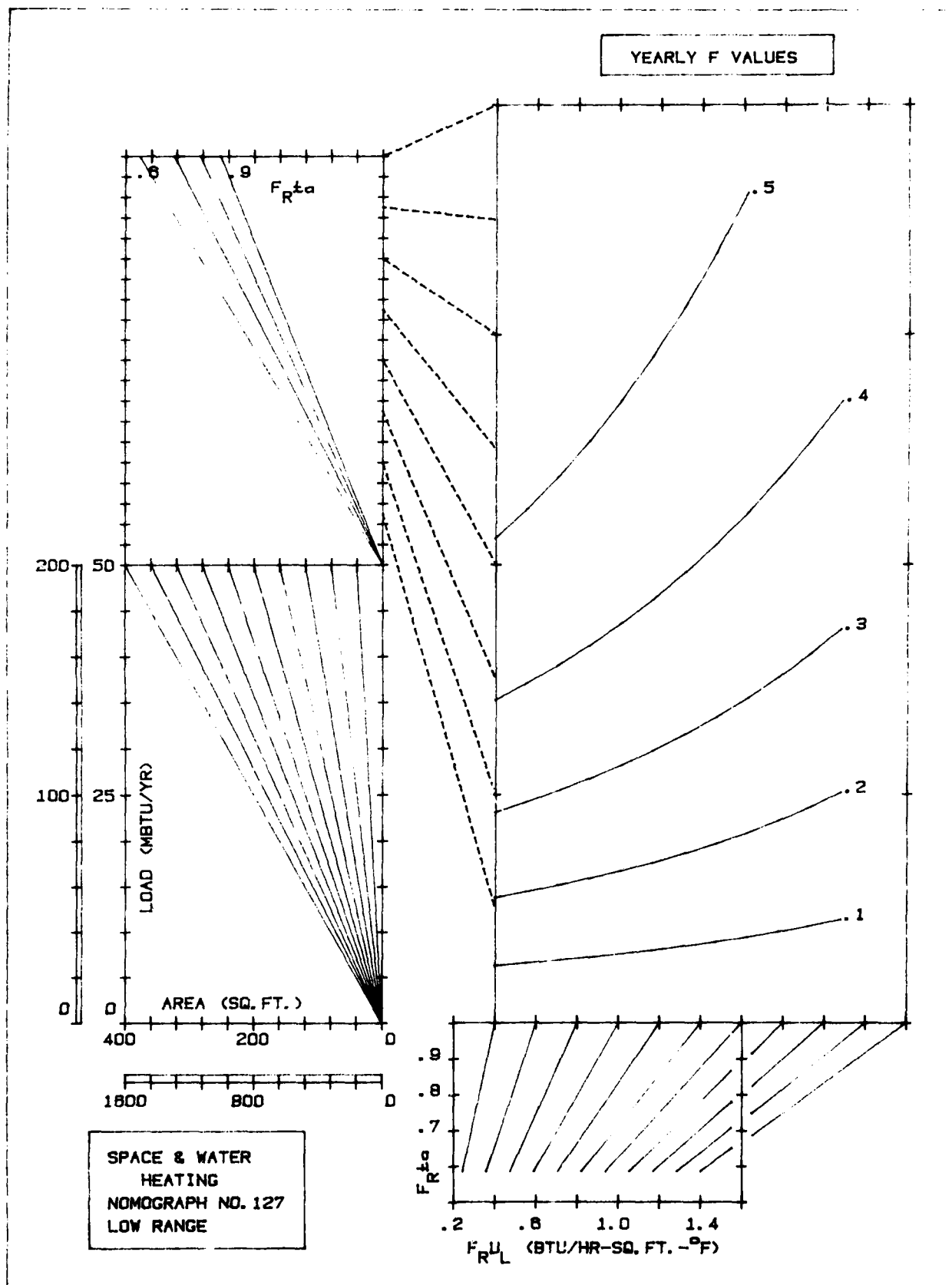


PREPARED 22 JUL 82 FOR AFESC BY USAFA/DFMS

B192

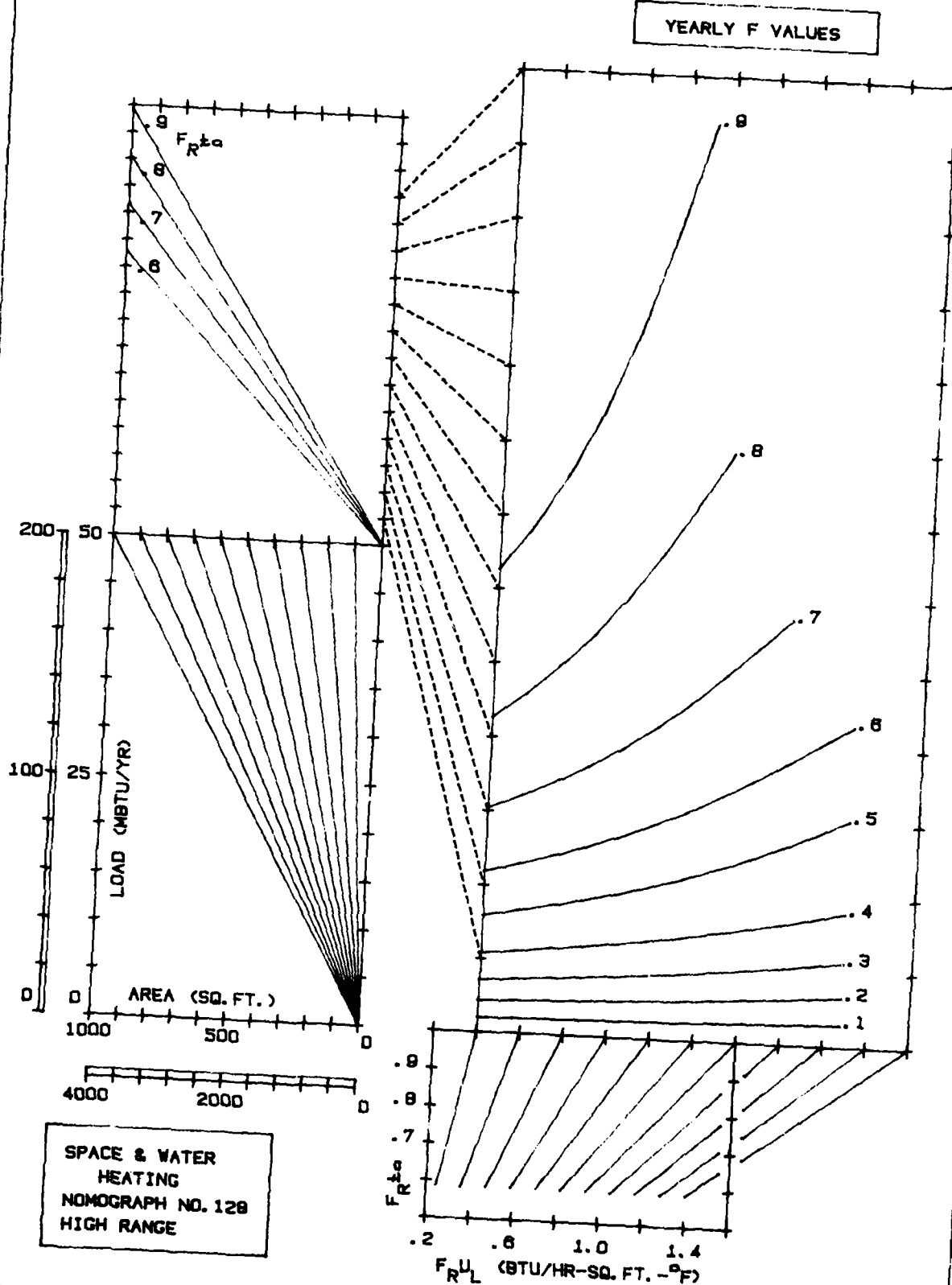


PREPARED 22 JUL 82 FOR AFESC BY USAFA/DFMS



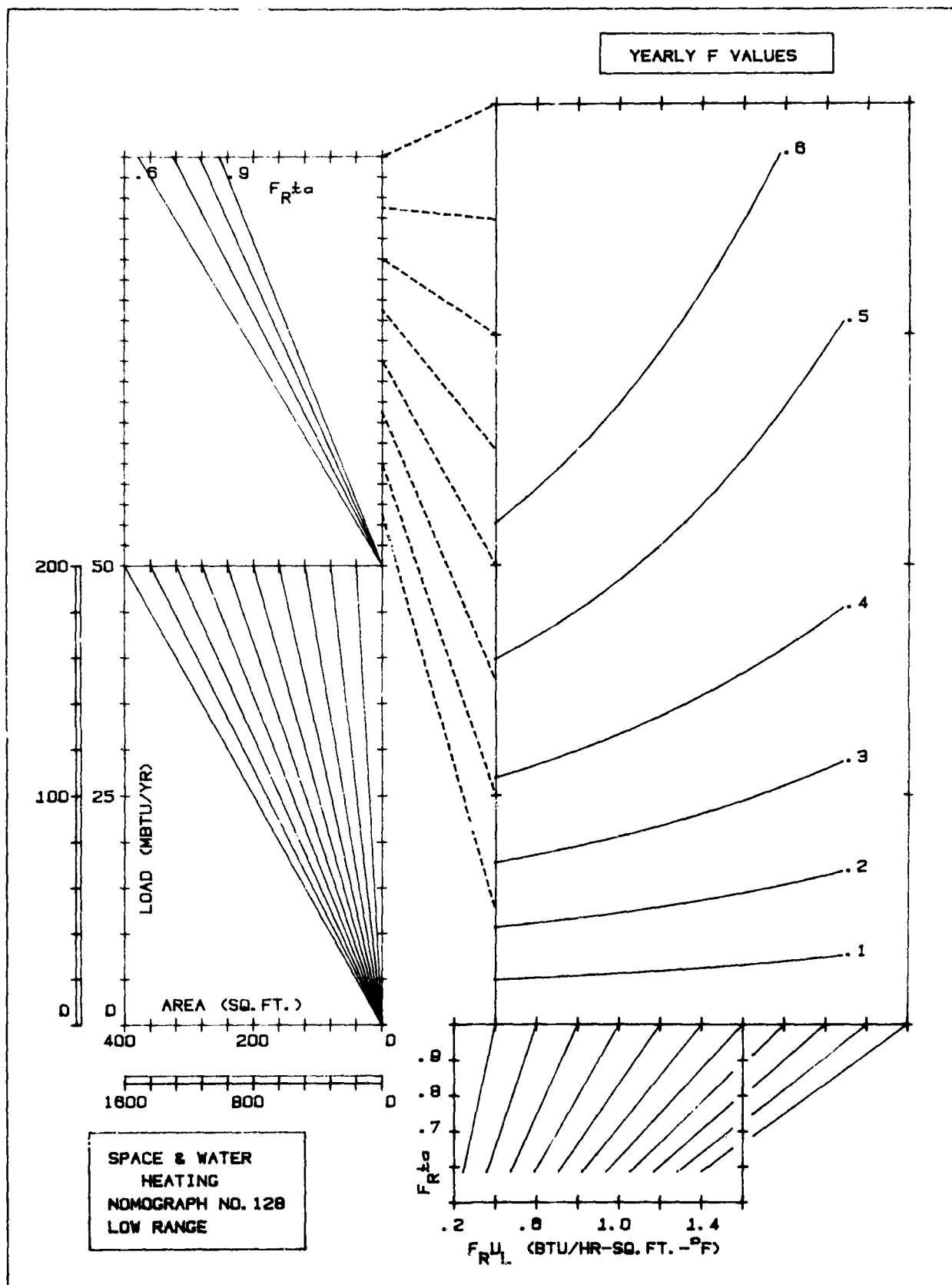
PREPARED 22 JUL 82 FOR AFESC BY USAFA/DFMS

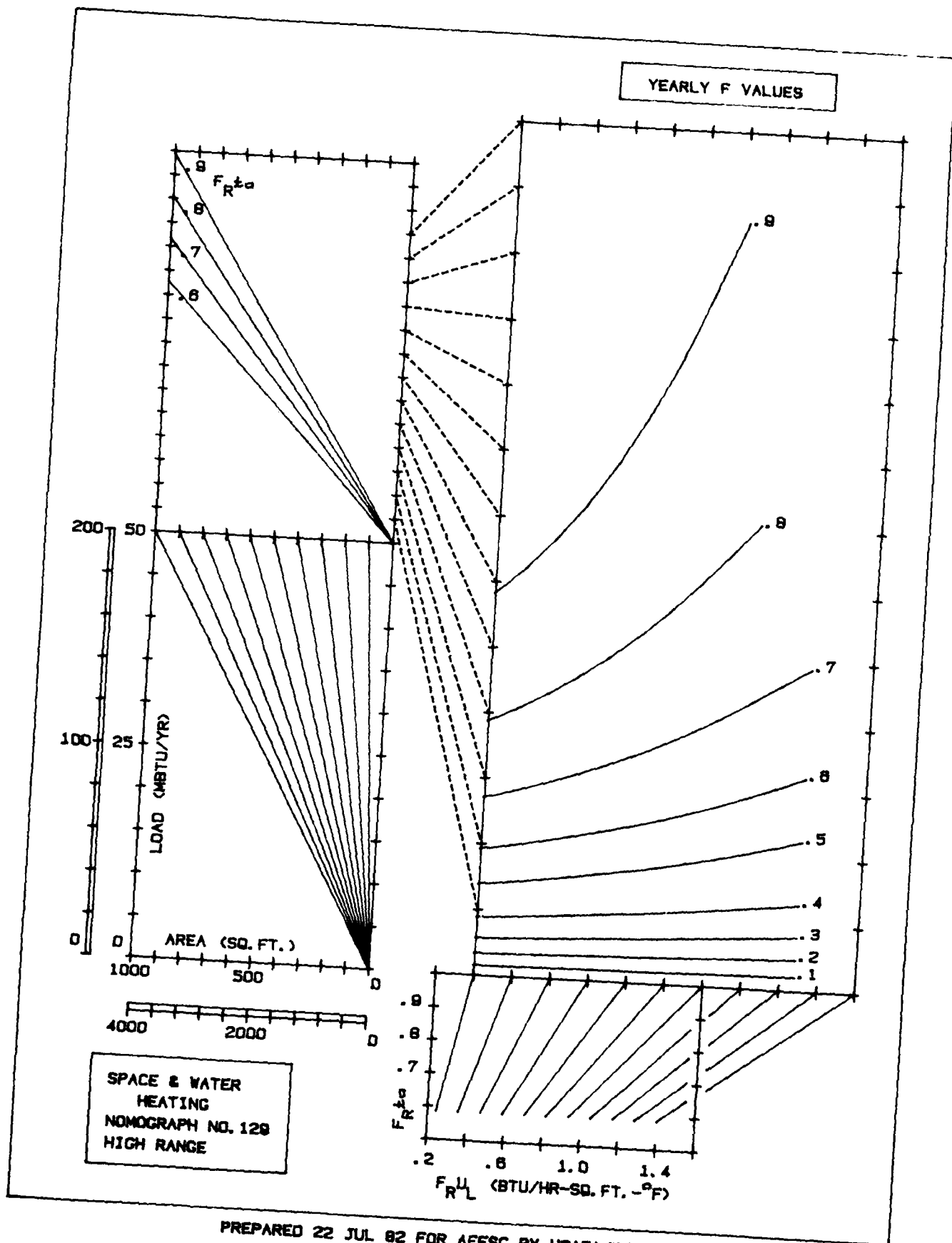




PREPARED 22 JUL 82 FOR AFESC BY USAFA/DFMS

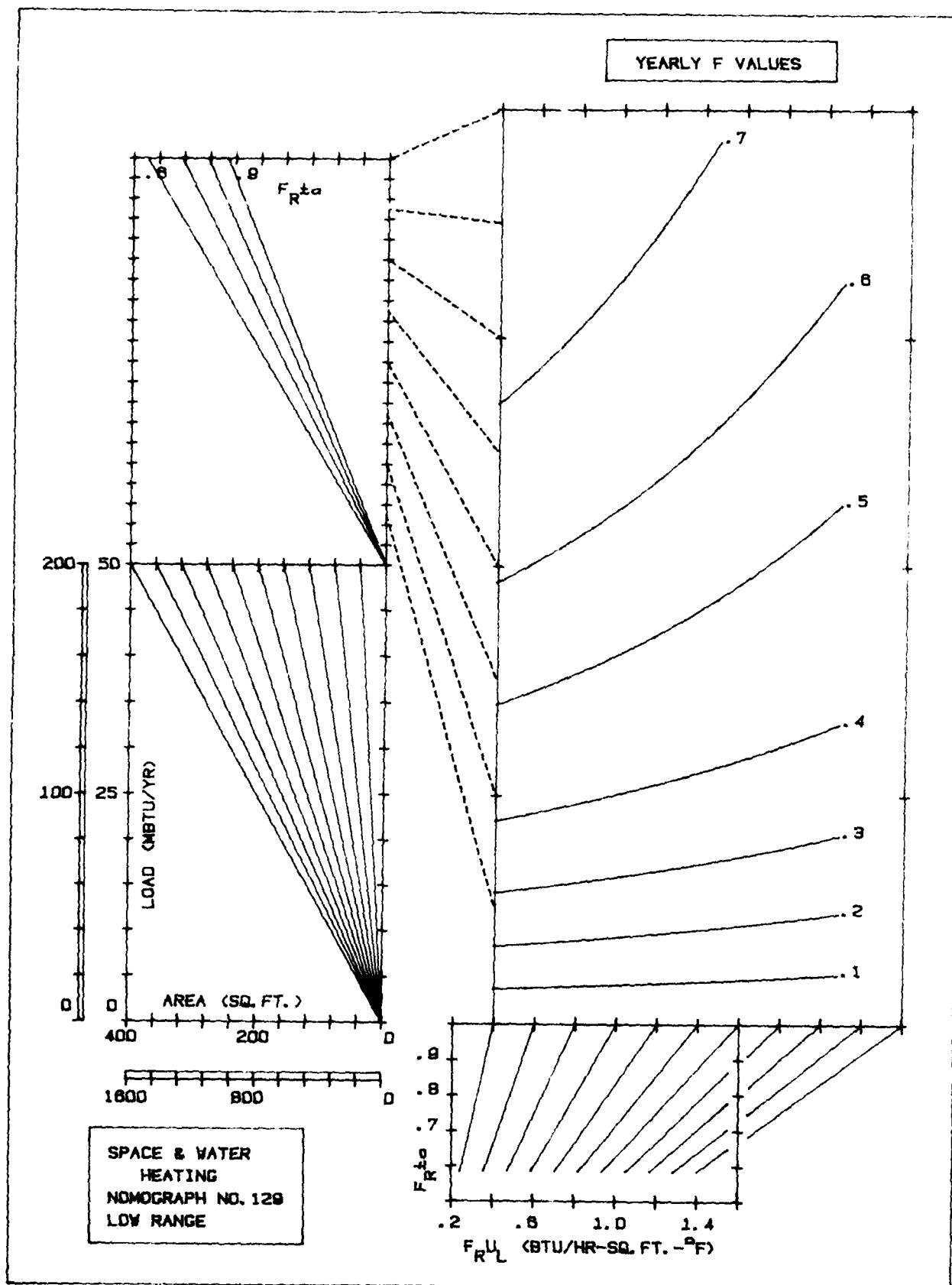
B195





PREPARED 22 JUL 82 FOR AFESC BY USAFA/DFMS

B197



PREPARED 22 JUL 62 FOR AFSC BY USAFA/DFMS

B198

ATE  
LME